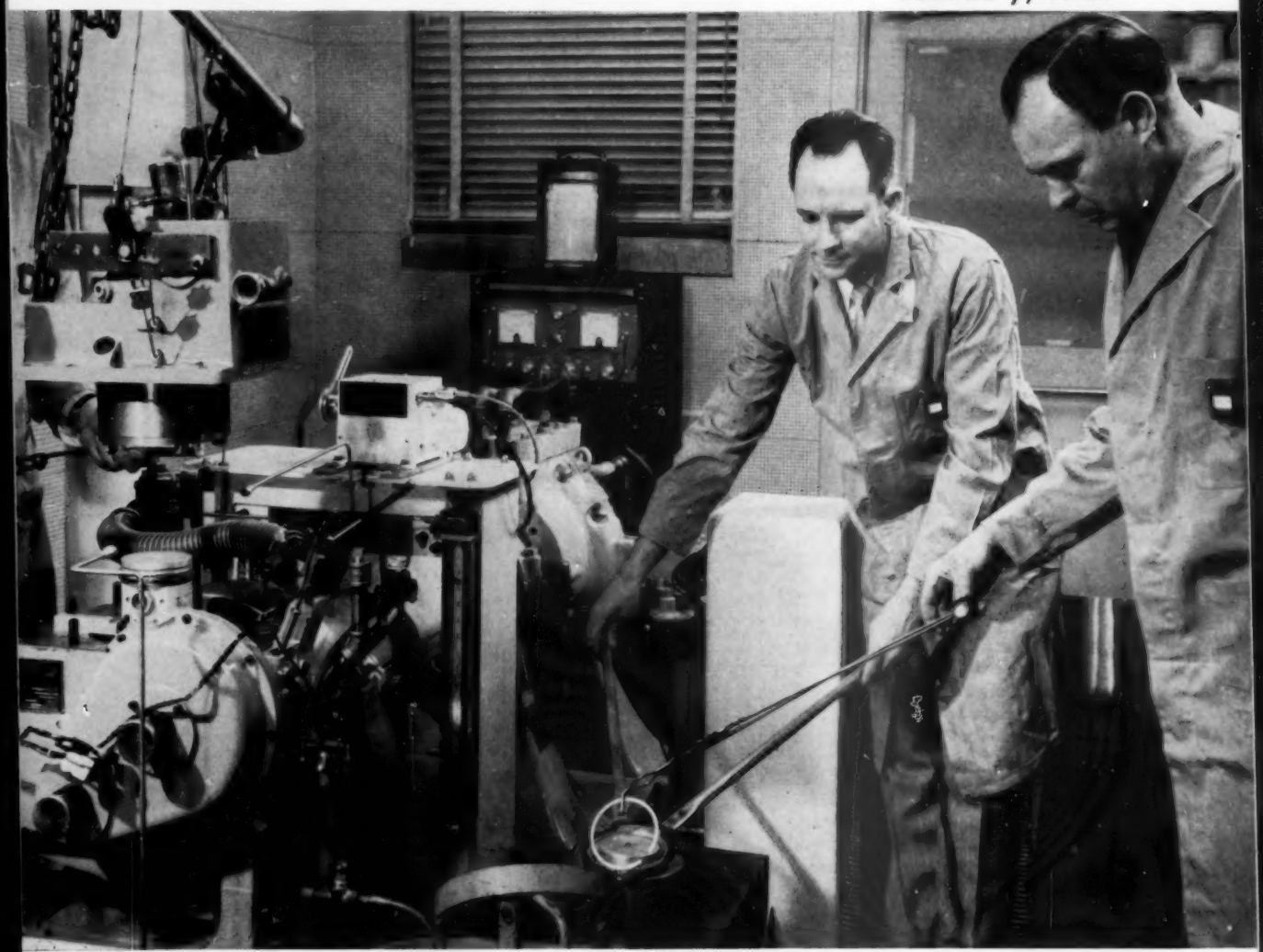
Automotive Service Digest

Our 47th year

February, 1959



Atoms "tattle" on oil change intervals—See Page 44

Only Perfect Circle gives you

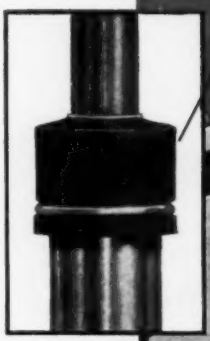
2-WAY POWER PROTECTION!

1. Perfect Circle Valve Seals

solve problem of excessive oil consumption past valves!

New rings and restored valve efficiency produce higher compression pressures—and higher deceleration vacuum. Increased vacuum draws oil through loose and worn valve guides. Stop this loss with *new* Perfect Circle Valve Seals!

Be sure of customer satisfaction—Install Perfect Circle Valve Seals on all re-ring and valve jobs.



2. Perfect Circle 2-in-1 Chrome Sets

solve problem of excessive oil consumption past pistons!

2-in-1 Chrome sets provide the finest piston rings obtainable! Top rings and oil rings are plated with thick, solid chrome. Doubles life of cylinders, rings, pistons. No tedious break-in is necessary, rings are pre-seated at factory.

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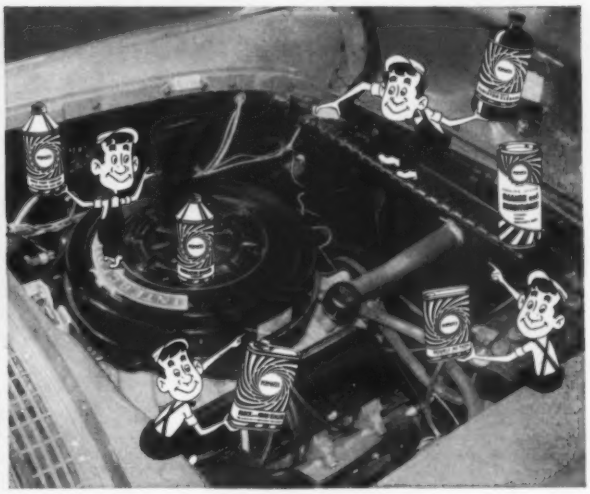
whatever you clean and polish...

whatever you need to seal...



whatever needs service oils and fluids... whatever a cooling system needs...

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You spend so much valuable *time* on all these jobs . . . isn't it logical to do them *right* . . . with the *best* products? Permatex products cost no more . . . yet do their jobs better and easier . . . make your work look good, last longer, satisfy customers more. And they're all made exclusively for you! Chemical products . . . made for the professional.

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"traps road dirt, frees power!"

"Whatever kind of a car you drive, new or old, big or small, the Carter in-the-line Gasoline Filter really does the job in delivering clean, pure power to the engine. I know—I've got one on my car—and two more on my cruiser."

Tom McCahill

Tom McCahill is known to millions of motorists throughout the country. When he says something, they stop, look . . . and buy! Tom's famous face will be featured in Carter's mighty advertising push to your customers!

HERE IS AN UNTAPPED MARKET—A GOLD MINE OF SALES FOR YOU IN THIS FAST-MOVING, FAST-PROFIT ITEM—SUCCESSFULLY TEST-MARKETED TO SELL FOR $3.95 plus installation

Three out of every four cars on the road today don't have gasoline filters—yet need them to get all the power and performance in today's modern fuels! In fact, surveys show only 1% of all motorists even realize there is such a thing as a gasoline filter! This means a brand-new field of profits for you in the revolutionary new Carter in-the-line Gasoline Filter—because we're selling it to motorists as a completely new idea—a completely new product!

Not only that, but we've already proved this filter's power to pull sales for you—at the popular $3.95 price—by advertising and promoting to motorists in two of the toughest test cities in the country! Now we're opening up this gold mine of sales right in your own home town—get ready to pick up your profits!

FULL PAGES IN THE POST AND LIFE

Full-page, across-the-board blasts in both LIFE and THE SATURDAY EVENING POST—followed by a hard-hitting schedule of full pages and half-pages in THE POST or LIFE every week! A socko Window Poster—an Ad Reprint Poster—a colorful Consumer Folder designed to get sales from both the impulse-buyer and the motorist who likes "to think it over"—an attention-getting Display Rack, striking Display Carton and handsome, individually packaged Filters—wrapped into one of the fastest-moving profit "packages" you ever handled!

50
FIFTY YEARS OF ENGINEERING THE FUTURE

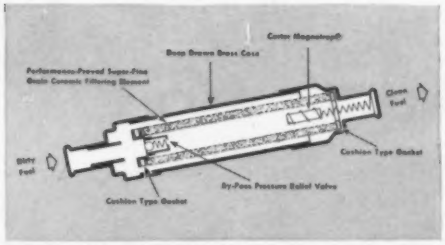
CARTER

opens up big, easy-to-sell market

4 motorists!

IN-THE-LINE

FILTER



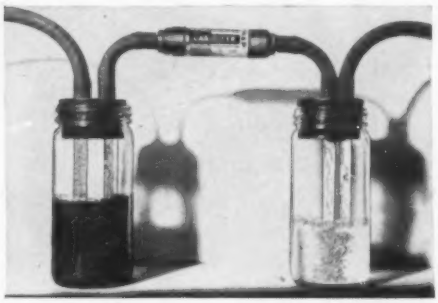
UNIQUE DESIGN of Carter in-the-line Gasoline Filter provides maximum available surface to trap dirt and foreign particles as gasoline is forced through filtering element.

MOTORISTS WANT IT, NEED IT BECAUSE:

increases power and gas mileage • stops gas waste, flooding, stalling caused by road dirt, foreign particles that enter every gas line • traps invisible metal oxides with Magnatrap® • Extensive laboratory research, plus exhaustive road testing covering hundreds of thousands of miles, proves the Carter in-the-line Gasoline Filter affords maximum filtering performance for one full year under normal driving conditions, without filter replacement.

SERVICEMEN, MECHANICS PRAISE IT

"... it'll sell like hotcakes!" "No more crowded, cramped and cussed installations—I can choose where to put it on the fuel line ..." "Easiest thing in the world to replace." "Sure can sell these. It's an item that will bring customers in." ("that little tube-cutter is terrific!") "Neat-looking—magnatrap is a good idea to catch metal oxides." "I can sell it almost every time I raise a hood!"



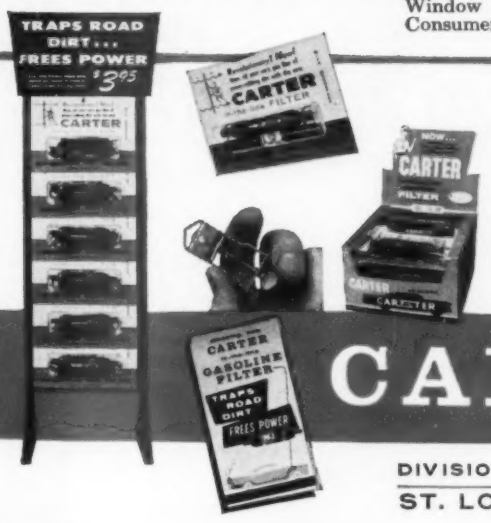
DRAMATIC COLOR-TRACER TESTS PROVE FILTERING ACTION

Scientific tests by independent research organization prove Carter Filter stops 99.5% of all gas line impurities small as 1/100,000th of an inch and 93.7% of particles even smaller.

FREE!

With your initial order for a Carton of 10 Filters, you get this eye-catching, space-saving DISPLAY RACK, the handy TUBE-CUTTER (has dozens of uses), two Window Posters and 50 colorful Consumer Folders!

Each filter individually packaged in gleaming transparent plastic case . . . colorful Carton itself is a self-selling display unit. Each Carton contains one universal assortment for complete coverage of today's cars —no need for you to stock slow-moving odd sizes in quantity.



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Go after extra midwinter profits right now with this red-hot replacement item—genuine MoPar Micronic Oil Filters!

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No. 565

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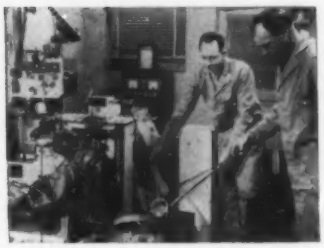
February 1959

Automotive Service Digest



Cover Subject

Radioactive piston rings "report" on best oil change intervals at Gulf Oil Research Center. Run in lab test engine, atom-tagged rings induce radioactivity in oil and permit measurement of wear rate.

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Technical help for the service shop

Tech Know-How articles cover how-to and what's new in approved, up-to-date shop practices, as seen and understood by men experienced in the trade. ***Business Know-How***, the dollar-sign side of automotive service work; ***Service Education***, the who-what-where-how of today's trade training.

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Automotive clinic

Stuck on some problem? Need help on a job? Write us about your problem on your shop letterhead and the information you are looking for will be promptly sent you.

Address your letter to Automotive Clinic c/o AUTOMOTIVE SERVICE DIGEST, 900 S. Wabash Ave., Chicago 5, Ill.

Ben Ikert, Editor

Switching Engines

In regards to a 1948, four-wheel drive Willys truck, what six-cylinder engine can be fitted in place of the present four-cylinder engine? The latter engine hasn't enough power desired in high gear. What must be done to convert it? The truck is used as a wrecker.—*L.S., Manitowoc, Wis.*

Answer: The Willys 1946 to 57 six-cylinder engine is interchangeable with the four-cylinder engine. If you should use a six-cylinder passenger car engine, you may have to use the oil pan from the utility engine, (six cylinder).

You should be able to use the same generator, but will need the distributor, carburetor and starting motor that are suitable for the six. The fuel pump on the four cylinder, should have enough capacity for the six-cylinder engine but if it does not fit you will have to get one that does, either from the car maker or jobber.

The change from one engine to the other should be made without too much difficulty.

Battery Runs Down

A troublesome thing has come up in a 1954 Hillman for which we would like your suggestions as to a possible remedy.

It seems in driving the car that some electrical defect is causing wear on the battery. A new voltage regulator was installed as we thought this would effect a remedy. However, the trouble still persists. What do you think the answer is?—*W.E., Franklin, Pa.*

Answer: You mention that some electrical defect is causing wear in the battery. We assume from this that you mean the battery does not hold its charge. First, test the battery by checking the gravity, which should be 1.275 or over at 80 deg. F., and by checking the voltage drop which should not exceed 1 volt on a 6 volt, or 2 volts on a 12 volt battery, when operating the starting motor for 15 seconds.

If the battery proves to be OK, then check for a short, somewhere in the electrical system. One way to find out if there is electrical leakage is to disconnect the hot side of the battery and see if there is any voltage drop between the battery post and the disconnected end of the battery cable. If all circuits are open and there are no grounds, or shorts, other than the normal grounds, there will be no voltmeter reading. If there is a reading, obviously something is wrong.

If there is an electrically-driven clock, disconnect it. Then, if you get a voltmeter reading, you will have to localize the electrical leak by disconnecting one appliance at a time until you find one, the removal of which makes the meter read zero. Then either rewire this circuit or find the faulty spot and correct. After that, check the charging voltage to keep the battery in a state of charge.

WHEN CHANGING YOUR ADDRESS

Please notify us 5 weeks in advance. Supply us with both your old and new address, including address label from current issue if possible. Copies we mail to your old address will not be delivered by the Post Office unless you pay them extra postage. Mail address changes to Circulation Dept., Automotive Service Digest, 900 South Wabash Ave., Chicago 5, Ill.

Seasoning Blocks

We had a discussion involving Rolls-Royce engine blocks. I claim the block is seasoned anywhere from 6 to 10 years, and why, may I ask, is this seasoning necessary? Would like your advice.—*L.S., Brooklyn, N.Y.*

Answer: In the early days of automobile manufacturing, it was considered necessary to season castings used in engines to avoid distortion due to heat strains induced by alternate heating and cooling. Some castings were seasoned as much as a year. But with the improvement in metallurgy and the intense production methods that gradually came into use, it has been amply demonstrated that excellent and long-lived engines can be made and used, with castings going practically immediately to the machine shop from the foundry.

We are not too familiar with the precise methods used in the production of Rolls-Royce engines, but we assume that the British have about kept up with us in metallurgy, and therefore are able to produce excellent engines without the need for extremly long seasoning of cast iron-engine blocks and heads.

The purpose of seasoning is to relieve internal strains that may possibly be set up in the casting process. Good design of the casting, good molding practice, heat treating where necessary, have eliminated the need for natural seasoning.

Water Tube In Block

Please furnish information on water distributing tubes. How are they removed and replaced? Do they affect engine cooling very much?

Recently an International truck and a Ford-V8 were brought in because water was being lost through the overflow pipe. Radiators were checked on a flow tester for evidence of radiator stoppage but didn't indicate need of cleaning. Block was reverse flushed but trouble wasn't corrected.

This brings up the question as to how big a part the water distributor tubes have on engine operation. Replacing tubes does not seem to be carried out to any extent to my knowledge. Is this due to lack of information or is it not too often required?

Operating Ford V8's without thermostats was said to cause water being thrown through the overflow, is there any basis for this statement?—*T.W., Lone Oak, Ky.*

Answer: A number of six cylinder and eight in line cylinder engines have used water distributing tubes for the purpose of giving improved distribution in the water jacket. This tube is

(Continued on page 8)

Ever had a hankerin' for a *Snap-on* set like this?

Call it pride . . . call it "feel" for really good tools . . . call it anything you like — but deep down in the heart of every real mechanic there's a hankerin' for a tool layout like this.

When you've got a rush job — and the tool you need most isn't in your collection — that's when it hits you. That's when you whack the bench and say, *"Some day I'm gonna have a boxful!"*

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And it isn't just pride — or feel. This big *Snap-on* tool layout is a solid income booster for the individual mechanic, repair shop, or service station operator who really wants to make money in the repair business. The extra money is in the speed with which you turn out jobs. Speed comes from both tool selection and quality. You get both in this *Snap-on* set.

- ¼-in. drive Socket Set, 19 tools
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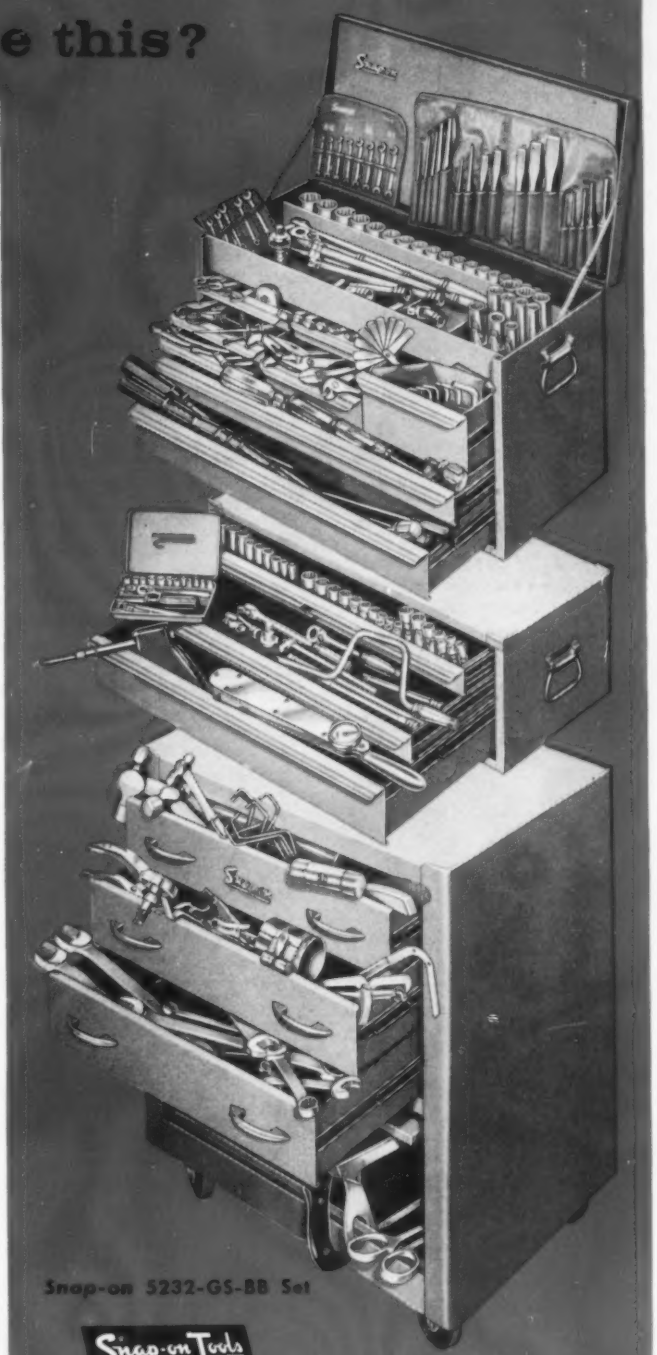
- Dwarf Boxockets, 5/16-in. to 13/16-in.
- Ignition Wrenches, 13/64-in. to ⅜-in.
- Tappet Wrenches, ¾-in. to 1⅛-in.
- Hex Head Wrenches, 3/64-in. to 3/16-in.
- Pliers Set, 7 tools
- Standard Screwdrivers, 13 tools
- Phillips Screwdrivers, 5 tools
- Chisels and Punches, 17 tools
- Torqometer, 150 ft-lb
- Soldering Gun
- Hack Saw Frame, 10-in. - 12-in.
- Junior Hack Saw and 12 Blades
- Tinners Snips, 3-in. Blades
- Hammer Head Screwdriver
- Vise-Grip Wrench
- Wire Brush
- 8-ft Steel Tape Rule
- 4-oz Ball Peen Hammer
- 12-oz Ball Peen Hammer
- 2-lb Ball Peen Hammer
- 1-lb Plastic Tip Hammer
- Set of Brake Cyl. Clamps
- Brake Shoe Spring Compr.
- Brake Adjusting Tool
- Electric Circuit Tester
- Brake Spring Plier
- Spark Plug Gauge
- Feeler Gauge
- Valve Adjusting Tool
- Valve Key Replacer
- Valve Spring Compressor
- Valve Lifter
- Ring Groove Tool
- Piston Ring Compressor
- Pry Bar
- Carbon Scraper
- Ratcheting Boxocket, ½-in. and 5/16-in.



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Automotive Clinic . . .

(Continued from page 6)

pushed into the cylinder block from the front of the engine and is held in place by the water pump, or a plate on the front of the engine. The radiator has to be removed as well as the water pump to get the water distributing tube out of the block. It is not general practice to use this tube on V8 engines as their shorter length and cylinder block design do not require it.

These tubes are quite important in engines which use them, and if they are in bad condition they must be replaced in order to have a cool running engine without hot spots. As you imply, this subject is neglected, due to lack of information in most cases. On line engines which overheat, a bad tube should be suspected, if timing, lubrication, etc. have been checked out.

It is possible that lack of a thermostat might permit sufficient liquid velocity to cause water to be lost through the overflow, but it should be remembered that with pressure radiator caps, the overflow opening is shut off, unless pressure in the cooling system exceeds the pressure setting of the cap. Most Ford caps are set for a pressure of about 15 p.s.i., so it is unlikely that water will be lost due to lack of a thermostat if the right cap is used.

The worst effect of lack of thermostat is a longer period of cold engine operation, not good for an engine. Also there will be slow heating of the coolant, which gives unsatisfactory heater operation.

PROFIT FROM MOTORIST'S NO. 1 ENEMY

More than 13,000,000 road breakdowns were caused by battery or charging circuit failures in 1957. Regular testing will stop this terrible yearly waste of $50,000,000. Regular testing will also give you a handsome profit in battery sales and charges.

Surveys show you will sell 1 battery and 4 charges every time you test 10 batteries. Fox Battery Servicing Equipment is the key to all these profits.

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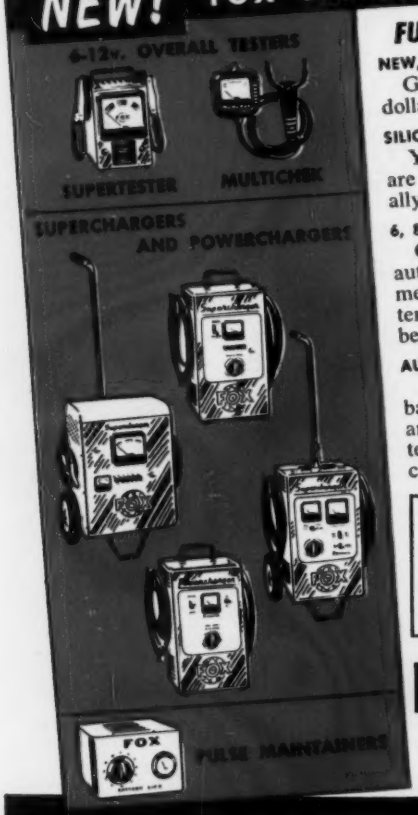

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AUTOMATIC CUT-OFF. All you have to do is connect to battery. Safetronic controls take over and automatically cut off when battery is fully charged. Electric timer cut-off models also available.

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Write today for FREE "Get Your Battery Checked" SIGN and Profitable Hints on Battery Servicing. Fox Products Co., 4704 N. 18th St., Phila. 41, Pa.

FOX BATTERY SERVICING EQUIPMENT

Want Better Gas Mileage

Would like information on improving the gas mileage on a 1957 Ford. This car has a four-barrel carburetor and owner gets about 10-12 miles per gallon.

We have been told that leaner high speed jets can be installed to improve mileage. Owner does not mind less top speed or slower acceleration.

Could thicker head gaskets be installed so regular, instead of premium gas, can be used? What about different spark plugs, etc., to help boost the mileage? Sure would appreciate any help you can send me. —*E.H., Deerfield, Ill.*

Answer: You do not state which Ford engine you have or whether this car is equipped with the Ford, the Holley, or the Carter AFB carburetor. If you have either Ford or Holley you should be able to get high speed jets, .002 or .004 in. smaller than standard jets, which would give somewhat better mileage.

The mileage obtained also depends on how the car is used. On long runs at speeds of not over 60 mph. it should be possible to get 15 mpg. even with the present carburetor set-up, provided timing is according to factory specs, dwell is correct and spark plugs are in good condition. It would also be advisable to make a compression check to be sure that the engine is in good condition.

We would not advise putting a double gasket under the heads. Perhaps by retarding the spark a little, regular gasoline could be used which would save 3c or 4c a gallon and be equivalent to getting 1½ to 2 miles more per gallon, as far as fuel expense is concerned.

If you want smaller jets for a Carter AFB, get them from a Carter jobber. On short runs, in cold weather, 10-12 miles per gallon is about average.

Generator Burns Out

Having trouble with a customer's car. It keeps burning out the generator armature. It's a 1955 V8 Chevrolet with radio and heater. We installed three armatures and one new regulator in 6 months. The generator kept checking out all right.

Recently, we decided to put on a

newly rebuilt 10-U8C3 generator and new regulator. The car ran about 30 days and the armature burned up again. So, we checked the wires again. Engine ground, battery cables and everything else checked, so we put on another newly rebuilt generator. This time it didn't run 20 miles and burnt out again.

We checked again, still not finding anything, but we have to keep the car going so we put on another new regulator. This probably won't run very far either. What is the matter?—*H.N., Hamill, S.D.*

Answer: There are two generators specified for the 1955 Chevrolet. One is DR#1102020 rated at 30 amps at 2150 rpm. using regulator DR#118825. The other one is DR#1100310 rated at 25 amps at 2780 rpm. using regulator DR#118945. Both should have the regulator set at 4.5 volts and current regulator set at 25 amps.

It is possible that you have the wrong pulley sizes and the generator is operating too fast so the regulator cannot control output of the generator.

Use a voltmeter to check for any resistance in charging circuit, especially watching for good grounds. Be sure there's a good ground from body to engine. High resistance could boost voltage up high enough to cause the trouble you describe.

The only causes for generators burning out are: overload, too high a speed, high resistance in charging circuit, defective regulator, or too high a voltage. A badly sulphated battery might increase the voltage, so check the battery for capacity and voltage drop under load. Check for possible shorts or grounds.

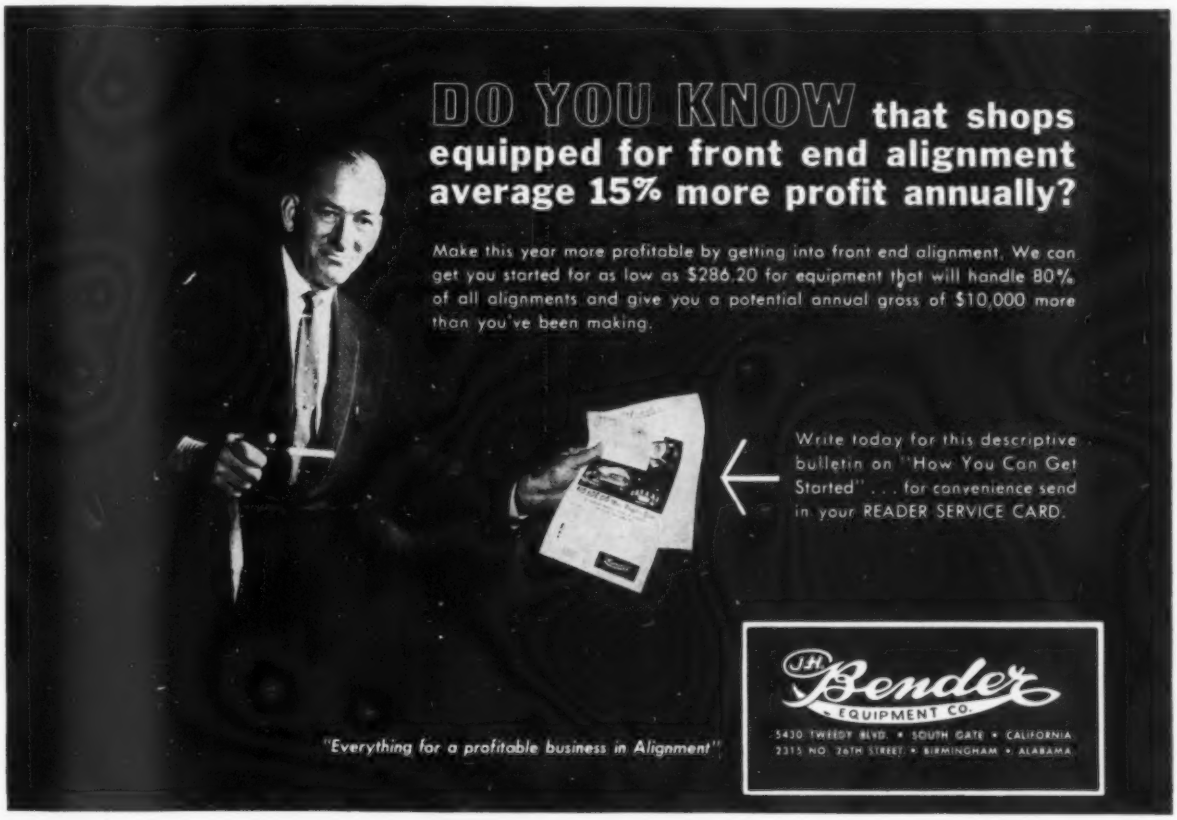
Engine Starts Hard

The engine of a 1955 Ford Station Wagon is very hard to start. Especially is this true when the engine is cold, after it has been standing for 15 or 20 minutes. The car has been serviced by several shops and the owner has spent some $160.00 to overcome the trouble.

We have checked just about everything—overhauled starting motor, put in a new coil, new carburetor, adjusted valves and so on. Compression varies from 75-90 lbs. Valve clearance is .008 and .010 in. Car runs OK on the road and will start easily with a short push. Seems like the starter and flywheel gearing is not the ratio to spin the engine fast enough. Spark gap is .030 in. Will be pleased to get your suggestions.—*H.S., Fairtown, N.J.*

Answer: It would appear if the owner spent $160.00 on the car he spent it in the wrong place. In the first place, the compression is only 75-90 lbs. whereas it should be 125 lbs. minimum. This indicates the need for a valve job, a ring job or both. A test with a cylinder leakage tester will tell you where the trouble is; another deviation from specifications is the valve clearance. You give .008 and .010, which should be .015 and .019 hot. Another defect is the spark plug gap, which should be .034 instead of .030. You mention a new battery but do not give any test results. New batteries may need charging, so suggest that you check this and get gravity up to at least 1.275 at 80 deg. F. or make correction of 4" "points" of gravity for each 10 deg. (add) below 80 deg. F.

Check the dwell which should be 35 deg.-38 deg., point spacing .024-.026 in. Check spark timing which should be 3 deg. BTC. Check high tension wiring for high resistance. Check polarity at the plugs, which should be negative. These engines are generally easy starters, except in some cases, after standing hot for 15-20 minutes, it may take up to 5 seconds to start due to gas vapors seeping into the air cleaner and carburetor throat. Getting the engine within required specifications should correct the hard starting.


DO YOU KNOW that shops equipped for front end alignment average 15% more profit annually?
Make this year more profitable by getting into front end alignment. We can get you started for as low as $286.20 for equipment that will handle 80% of all alignments and give you a potential annual gross of $10,000 more than you've been making.
Write today for this descriptive bulletin on "How You Can Get Started" . . . for convenience send in your READER SERVICE CARD.
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5430 TWEEDY BLVD. • SOUTH GATE • CALIFORNIA
2315 NO. 26TH STREET • BIRMINGHAM • ALABAMA
"Everything for a profitable business in Alignment"

"Should I put in colder plugs for high-speed highway driving?"

"Should I put in hotter plugs for low-speed city driving?"

STOP PLAYING THE SPARK PLUG "GUESSING GAME"! STANDARDIZE ON AUTO-LITE POWER TIP BECAUSE—

Auto-Lite® Power Tip "fires up" today's engines* at all speeds!

AUTO-LITE POWER TIP CLEANS ITSELF WHILE YOU DRIVE!

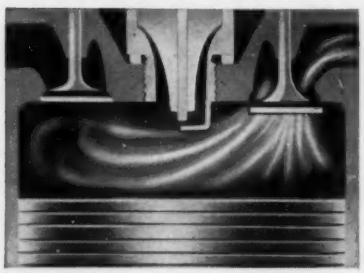
Here's why Power Tip is your safe choice for today's engines!

Smart dealers know they can depend on Auto-Lite Power Tip to protect their most valuable asset . . . customer satisfaction. That's because Power Tip "fires up" today's overhead-valve engines at all speeds—and keeps them "fired up" in all kinds of driving. More and more dealers are standardizing on Power Tip for all overhead-valve engines because it takes the "guesswork" out of spark plug selection.

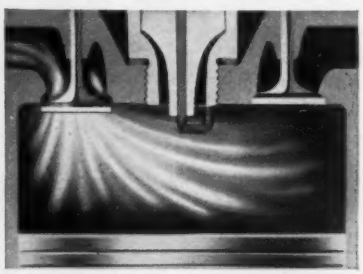
Install Power Tip in your customers' cars. Take the "guesswork" out of your spark plug service and be sure of completely satisfying your customers. Stock Power Tip today!

*Power Tip, with or without Resistor, is ignition engineered for overhead-valve V-8 engines and for most overhead-valve 6-cylinder engines in all cars on the next page. You need to stock only 7 Power Tip numbers to give you *safe* coverage of over 95% of your customers' cars. *Standardize* on Power Tip today!

THE ELECTRIC AUTO-LITE COMPANY • TOLEDO 1, OHIO



AT LOW SPEEDS, the projecting Power Tip is in the thick of combustion where it gets hot quicker and stays hot to burn fouling deposits away *clean!*



AT HIGH SPEEDS, the projecting tip is in the path of incoming air-fuel mixture where it stays cooler to effectively *check* damaging pre-ignition.

AUTO-LITE® RESISTOR SPARK PLUGS WITH POWER TIP

YOU NEED ONLY 7 POWER TIP NUMBERS TO COVER MOST OF YOUR CUSTOMERS' CARS*

BUICK

1949-53 Inline 8 Cyl.....A82
1953-55 V8.....A52
1956-59 V8.....A42

CADILLAC

1949-54.....A82
1955.....A52
1956-59.....A42

CHEVROLET

1949-53.....A82
1954-57 6 & V8.....A52
1958-59 6 & V8 ⅛" Reach...A42
1958-59 V8 ¼" Reach.....AGR42

CHRYSLER

1951-53 V8, All.....AR82
1954 V8, All.....AGR82
1955 V8 N.Y. & Imp....AGR52
1955-56 V8 Windsor.....AR52
1956-58 V8 N.Y.....AGR42
1957-58 V8 Wind. & Sara...AR42
1959 V8 Wind., Sara. & N.Y.....A42

DE SOTO

1952-54 V8, All.....AR82
1955 V8 Firedome.....AR82
1955 V8 Fireflite.....AR52
1956 V8 Exc. Adventurer..AR52
1956 V8 Adventurer.....AR42
1957-58 V8, All.....AR42
1959 V8 Exc. Adventurer..A42
1959 V8 Adventurer.....A32

DODGE

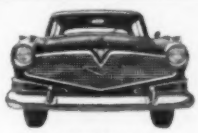
1953-54 V8.....AR82
1955 V8.....AR52
1956 V8 Except D500....AR52
1956 V8 D500.....AR42
1957-58 All V8 ⅜" Reach...AR42
1958 All V8 ¼" Reach..AGR42
1959 V8 Coronet.....AR42
1959 V8 Except D500.....A42
1959 V8 D500.....A32

EDSEL

1958 V8.....BF42
1959 6 Cyl. & 292 Cu. In. V8.....BF82
1959 All Other V8's.....BF42

FORD

1952-54 6 Cyl. O.H.V.....AL82
1954 V8 O.H.V.....AL82
1955-56 V8, All.....BF82
1955-59 6 Cyl.....BF82
1957 V8 272 Cu. In.....BF82
1957 All Other V8 and Thunderbird.....BF42
1958-59 V8 292 Cu. In.....BF82
1958-59 All Other V8 and Thunderbird.....BF42



HUDSON

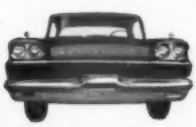
1955 V8 7/16" Reach.....AL82
1955-56 V8 ⅜" Reach.....AG52
1955-57 Metropolitan.....AG52
1956 Rambler.....AL82
1956 Hornet V8.....AL82
1957 Except Metropolitan AL82

IMPERIAL

1956-58 V8, All.....AGR42
1959 V8, All.....A42

LINCOLN

1952-54.....AL82
1955.....BF82
1956-59.....BF42



MERCURY

1954.....AL82
1955-56.....BF82
1957.....BF42
1958-59 V8 312 Cu. In.....BF82
1958-59 All Other V8's.....BF42

NASH

1946-53 O.H.V. Models Exc. Dual Jet Fire. A82
1953 Dual Jet Fire....AL82
1954-56 Ambassador 6 Cyl....A82
1955-56 Ambassador V8 Engs. 7/16" Reach. AL82
Engs. ¾" Reach..AG52
1956 Statesman.....AL82
1957 Ambassador V8....AL82
1954-57 Metropolitan.....AG52

OLDSMOBILE

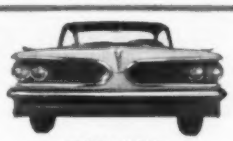
1949-54 V8.....A82
1955 V8.....A52
1956-59 V8.....A42

PACKARD

1955 V8 7/16" Reach.....AL82
¾" Reach.....AG52
1956 V8.....AG52
1958 V8.....AL82

PLYMOUTH

1955-56 V8, All.....AR52
1957 V8.....AR52
1958-59 V8 Except 1959 Commando.....AR42
1959 V8 Commando.....A32



PONTIAC

1955-59 V8.....A52
1959 Canadian 6 Cyl.....A52

RAMBLER

1956 6 Cyl.....AL82
1957-59 6 & V8 O.H.V.....AL82

STUDEBAKER

1951-58 V8 (Except 57 Golden Hawk)...AL82
1956 V8 Golden Hawk...AG52
1959 V8, All.....AL82

Auto-Lite RESISTOR Spark Plugs with Power Tip, recommended for long plug life and suppression of radio interference, can be used in place of all STANDARD Power Tip applications shown in these specifications.

CONTROL!

and in cars...

OIL CONTROL

with Sealed Power KromeX Piston Ring Sets with Stainless Steel Oil Rings

Stainless steel oil rings are the reasons America's largest engine builders are using Sealed Power rings as original equipment.

New design . . . new material ...fully tested! These rings come in fast, control oil even under high vacuum conditions or in tapered or out-of-round bores.

JUST ONE OF THE REASONS WHY

Notice how open the vents are in this portion of Sealed Power's stainless steel oil ring expander after 50,000 miles of service. The expander does not pit or corrode. Carbon cannot adhere. The main cause of oil ring failure is eliminated.

SEALED POWER CORPORATION • MUSKEGON, MICHIGAN

Sealed Power KromeX Ring Sets

BEST FOR RE-RING! **BEST FOR RE-BORE!**

BY HERB CARRIER
Detroit Editor

Spokes from the "hub"

● THE STAGE is getting set for some really big changes in American built cars. Small cars, produced by the Big Three, are just a step away from the haulaways. *And what small cars they will be!* Not just conventional cars that look like Cadillacs that have been left out in the sun too long, but completely new cars with amazing engineering innovations. New front wheel drives, new-theory automatic transmissions, new ignition systems, etc. Woe be unto the mechanic who services cars with an open tool box and a closed mind. Old timers—and young timers too, for that matter—will be forced into cracking books again to keep abreast of changing technology.

★ ★ ★

Don't be caught with your slants down. Bone up on your knowledge of fundamentals—especially electricity. Get in the habit of regular study. Mechanics of tomorrow are going to be a fast moving bunch. Today's mechanics, to stay in the race, will have to run like mad to keep from going backwards.

★ ★ ★

As an indication of the kind of things that soon will be coming out of Detroit, Stinson Aircraft and Tool Engineering Corp. of San Diego, Calif. publicly announced their plans to manufacture 10,000 *electrically driven* cars. Production is scheduled to begin about March of this year.

The car is to be a low-slung sports-type vehicle powered by a battery with sufficient capacity to run the car 78 miles before it needs recharging. Recharging can be accomplished by plugging into a regular household electrical outlet. Cost for recharging? About 18 cents in home electricity.

The new battery should have plenty of bite—it was developed by a dentist, Dr. Charles H. Graves, now vice president of the company. Two models of the car are planned: The Charles Town-About and the Charles Van-About. If the idea catches on, lots of working iron-benders will have to sharpen up on their electrical "know-about." Again, don't wait. If necessary, sacrifice some Friendly Tavern Time for some Public Library Time.

★ ★ ★

Continuing along the line of predictions-based-on-fact, Chrysler Corp. is making giant steps in readying their gas turbine engine for practical use in their standard production automobiles. In a recent test run, an economy mark of 19.39 miles per gallon was established on a 576-mile run from Toledo, Ohio to Woodbridge, N. J.

A similar test conducted two years ago averaged 13 to 14 miles per gallon. This proves that Chrysler's gas turbine has been improved in the m.p.g. department to where it is more than competitive with comparable piston engines; *and* it uses diesel fuel. The engine will run satisfactorily on turbo-jet aircraft fuel, clear gasoline, or even regular-grade automotive gasoline. Moreover, the turbine engine has no knock problems or octane requirements, so the tetraethyl lead additive is not necessary in its fuel.

Chrysler's research and development in the metallurical and design fields may speed gas turbines into production automobiles faster than some of us anticipate.

★ ★ ★

Going way out, a Longview, Wash. inventor has five Aerocars built and certified by the Civilian Aeronautics Association. The car (or would it be plane?) weighs 2,100 pounds, is equipped with a four-cylinder, 150-horsepower Lycoming engine, and can fly 500 miles on a 40 gallon tank full of fuel. The same engine is used for ground travel. Change, however, will affect the Aerocar. Its designer-inventor already has a jet Aerocar on the drawing board. Who knows, maybe automobile mechanics soon will be playing the game under A&E ground rules.

★ ★ ★

All the talk about training future mechanics seems to have made the greatest impression in Ohio.

Not long ago, the first graduation exercises for auto mechanics were held at the London Prison Farm in London, Ontario, Canada. The training program was hailed as a success. Its sponsor? The Ohio Automobile Dealers Association.

M. R. Purdy, president of the Ohio association said the program was designed to ease the problem of recruiting needed skilled automotive mechanics, and also to help make inmates self-supporting members of society when released from the farm.

★ ★ ★

Kudos to those who do something about mechanic training without waiting for legislation or sponsorship. The Klann Auto-Electric of Detroit, Mich. is a good example of what can be done on an independent basis. Each Monday evening Jack Klann and several of his people conduct an electrical training program for approximately eighty working mechanics. Their course of study takes them from electron theory all the way through oscilloscope operation.

The program started as an informal chit-chat session where working mechanics could swap on-the-job experiences. It snowballed so that Jack had to organize the men into classes. The enthusiastic response overflowed Klann's shop. Now, in addition to taking up all available floor space in the shop, one group meets down the street in the local Y.M.C.A. Could be that this is the answer to the mechanic training program. At least "doers" are always better than "talkers."

★ ★ ★

Electrical-electronic courses appear to be the most valuable to mechanic education. Apart from possible future electric-drive automobiles, there are large numbers of electrical devices used on conventional cars that require specific training. P. H. Neville, president of Leece-Neville Co. predicts six million dollars worth of their alternator-rectifier units will be used on automotive units built in 1959. By 1963, Neville sees the alternator as standard equipment.

Wherever performance really counts–

Experts in every field choose Champions—for dependability, power and performance! You've made them the favorite replacement spark plug. But did you know how completely experts in other fields agree with your choice? These photos—from Champion's current ads in magazines like LIFE, POST, LOOK, and READER'S DIGEST—give some examples.

CAR MAKERS – Over *twice* as many car makers (including Rolls Royce) specify Champions – 36 different makes in all!

FARM TRACTORS – *Every* major U.S. tractor maker uses Champions! If you sell spark plugs for tractors, always recommend Champions.

STOCK CARS – 9 out of 10 winning drivers pick Champions for peak engine efficiency – in *every* winning make of car!

TRUCK MAKERS – 18 of the 21 U.S. truck makers choose Champions for rugged performance. Put Champions in *all* the trucks you service.

the experts pick Champion spark plugs!

INDIANAPOLIS "500" – The big Indy track is the world's toughest proving ground – and 8 of the last 9 winners used Champions!

FIRE ENGINES – Customers want fast, sure starts? Tell them that's one reason *all* major fire engine makers use Champions.

AIRLINES – 98% of the world's airlines use Champions – because airlines *demand* quality, dependability and performance!

OUTBOARD MOTORS – Tell your boating customers that *every* major U.S. outboard maker selects Champions for easy starts, top performance.

America's favorite—

CHAMPION

SPARK PLUGS

Engineered for every car built by Ford, General Motors, Chrysler, American Motors, Studebaker-Packard, and every major foreign maker!

CHAMPION SPARK PLUG COMPANY • TOLEDO 1, OHIO

Hastings Chrome-Vent rings seat 3 to 4 times faster than any other chrome rings

● Want oil control in tapered, out-of-round or re-bored cylinders? Want faster seating ring jobs? Then you want Hastings Chrome-Vent oil rings. They assure positive oil control right now. They seat 3 to 4 times faster than any other chrome rings made. They eliminate profit-cutting come-backs.

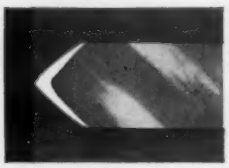
The Hastings patented *beveled chrome* rail makes *immediate fineline contact* with the cylinder wall. It has less contact area to wear-in—takes less time to break-in.

Chrome-Vent gives at least 3 times greater chrome wearing surface, too—because the thick chrome cap extends *around* the bevel. And, with the lighter inner-spring made possible by the beveled design, it makes gentle, soft-pressure contact with any cylinder wall.

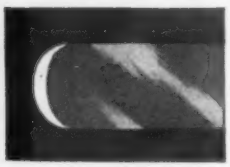
Always use Hastings, the product of replacement specialists. You'll be sure of a good profitable ring job and a satisfied customer, too.

HASTINGS MANUFACTURING COMPANY • HASTINGS, MICHIGAN
Hastings Ltd., Toronto
Piston Rings, Oil Filters, Casite, Spark Plugs

Hastings Rings are covered by
U.S. Patent Nos. 2148997, 2511874, 2565042, 2712971



BEVELED CHROME-VENT. Rails make fineline contact with cylinder wall for a faster seat. Less area to wear-in means less time to break-in.



CONVENTIONAL CHROME RAIL. Originated by Hastings . . . now replaced by Hastings exclusive *Beveled* Chrome.

HASTINGS

BEVELED CHROME-VENT PISTON RINGS

TOUGH
on oil-pumping

GENTLE
on cylinder walls

Editor's page

Shadows on the drawing boards

● FORECASTING THE FUTURE of an industry invariably has its hazards and uncertainties. The tempo of progress in varied fields of science, engineering and manufacturing is such that predicting the shape of things to come had best be done with tongue in cheek.

About the time a process or product has become stabilized to a point where it is a profitable venture for the manufacturer and a convenience or comfort to the buyer, along comes something new and better for replacement. The automobile industry has been no exception. What dealers are now selling on showroom floors and mechanics are fixing in today's shops, will become a far cry from suitable and saleable items in a decade or two.

Time was, for example, when the four-cylinder engine was touted as the acme of perfection for motor car propulsion. After that, came the six, eight, twelve and sixteen cylinder engine! Chassis components, bodies, glass, tires, fuel, lubricants and hosts of accessories followed suit in the march of progress.

The thousands visiting automobile shows, while they applaud the '59 creations of the manufacturers, must realize that these cars are but transition models. From out of the crucibles of the past, the new cars gleam to some extent with what's in store for the future. Apropos is the memorable saying, "Here am I. Whence have I come? Whither am I going?" Or, more bluntly, "Where do we go from here?"

Straws in the wind already indicate that the next 10 or 20 years will abound with design and manufacturing practices heretofore considered impractical or impossible. For one thing, weight will be used more effectively for better traction and braking. Cars are still too heavy for their size. Weight reduction will ensue from a more lavish use of aluminum—in engines, chassis and bodies.

To meet heavier ignition demands of future engines, there is talk of "pulse" ignition systems, eliminating conventional coils; of "transparent steel" for roof tops, and electrochemical power for driving each wheel of the vehicle individually. These are but a few of the bold ventures in the offing. Where, when and how the new developments will be used is a toss-up at the moment. But, they are knocking on the factory drawing boards; and as one engineer ably puts it, "this is a business where you have to run fast just to stay abreast of progress."

Ben Ikert
EDITOR

AUTOMOTIVE TECH KNOW-HOW

By ED PACKER,
Member, S.A.E.

Servicing con rod bearings

Skilled service specialists have perfected the practices that make for customer and shop satisfaction in the work. Any competent, experienced mechanic can handle the job . . . if he follows the ground rules—be thorough, let the outside expert handle certain operations, above all, practice cleanliness.

• CLOSE ATTENTION TO what some might call trifles is the key to satisfactory connecting rod bearing service. Cleanliness and precision are musts. Accurate fits are vital or a "shot" rod, as in Fig. 1, will result. Good workmanship along with accurate torquing must team up at every step of a con-rod job.

Final success begins as the engine is disassembled. To steam clean an engine before disassembling enables a mechanic to do his best work. Dirt and grit getting into the tools and on the mechanic's hands are likely to reach vital parts of the engine and annul an excellent job.

The use of the Federal-Mogul engine bearing oil leak detector (Fig. 2) is advantageous in several ways. Obviously, it proves the relative fit—or lack of fit—of the various bearings, including mains, rods, and camshaft bearings. Too often a good rod bearing job has failed at low mileage due to lack of oil—the lack coming from low oil pressure resulting from loose camshaft bearings.

After the rod bearings are down, the leak detector can be used to wash out the oil lines. And when the job is assembled—except for the oil pan—the leak detector can again come into play to prove that clearances are as they should be, and at the same time to provide the bearings with good fresh oil that will be on the job when the engine is started up.

Fig. 1. Rod bearing seizure caused by various conditions explained in this article can lead to a "mess" like that shown below.

A good rod bearing job is possible on all modern engines entirely from underneath. But a better bearing job usually results in many cases when each piston and rod assembly is pulled.

Either way you're doing the job, look closely for the identification marks on each rod and its cap (Fig. 3). And, if the assembly is being pulled, look also for the mark on the piston that shows the normal piston position in the cylinder.

Keep all parts together in the order in which they were removed from the engine, as close inspection should be made to learn the cause of bearing failure in order that the job may not fail again.

MARK PARTS WITH CARE

If it is necessary to mark the parts, use an extremely sharp punch or an electric needle on the rod and cap. Careless handling can upset the rod bearing bore and thus knock the precision insert out of true. And, *never* file the surface of the rod between the bearing bore and the piston pin bore. The surface is highly stressed when the engine is producing peak power. Any injury on this surface could invite the type of failure shown in Fig. 1.

Be alert when disassembling an engine for the previous incorrect installation of an offset type rod. At the left in Fig. 4, a correctly installed offset rod is shown. At the right, the arrows indicate points of serious interference where an offset rod has been put in the engine wrong.

Some mechanics look immediately for this possibility just as soon as the pan is down. But in any event, look at each of the old bearing inserts to see if there is a concentration of wear on one side of the upper insert, and on the opposite side of the lower insert. In a case of that kind, there will also be conspicuous wear or brightness on one side of the piston pin bore in the rod and on one piston pin boss.

When rebuilding an engine where a condition as just mentioned exists, install the rod the right way—so that it does not bind against the piston or the ends of the crank pin no matter what the original marking may have been.

But another thing happens to rods. They may be bent

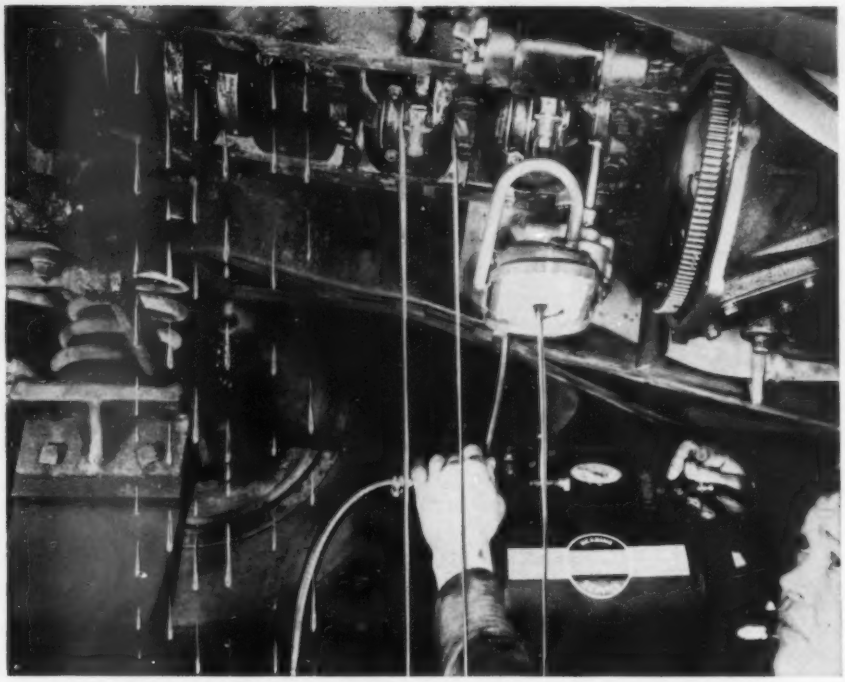


Fig. 2. Checking relative bearing clearance with oil under pressure. This equipment, which checks main, con rod and camshaft bearings, also flushes oil passages and prelubricates bearing jobs.

so that the piston pin is not parallel to the crankpin. They may also be twisted. These conditions are shown exaggerated of course, in Fig. 5.

A bent rod can sometimes be detected before the engine is disassembled. To run the engine slowly and put a load on it will sometimes bring in a rod noise. But to

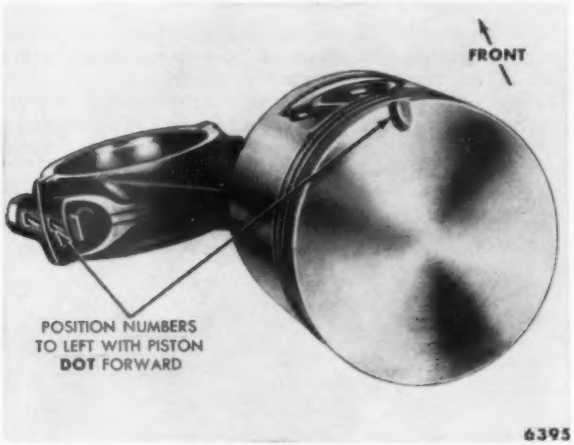


Fig. 3. Identifying marks that assure proper installation of connecting rod bearings, and positioning of piston in cylinder.

be quite honest about it, it is not a reliable way.

If you are replacing bearings by pulling each piston and rod assembly, then play it safe and check every rod on a reliable modern alignment tester. Some of these testers are designed to be used without removing the piston. On others, the piston must be removed from the rod.

If you are not planning to remove the piston and rod assembly, then look closely at each pair of rod bearing inserts. A bent connecting rod, for example, will create excessive wear on one side of the upper insert, and on the opposite side of the lower insert due to increased pressure on these areas (Fig. 6).

If the connecting rods are clamped to the piston pin and must be disassembled from the piston, then the assembly should be clamped in a piston vise (Fig. 7) when taking down or building up the assembly.

While it is true that some mechanics may "get by" by clamping the big end of the rod in a vise and turning the piston pin clamp screw, this procedure is really asking for trouble. Doing the job this way is inviting a sprung rod.

While the condition and fit of the piston and its pin influence the performance and life of the connecting rod bearings, piston and pin fitting is a subject in itself. So we will restrict this discussion to the lower rod bearing.

It is well to review, however, that a pin fit in a bushed rod is considered OK if it moves smoothly into position

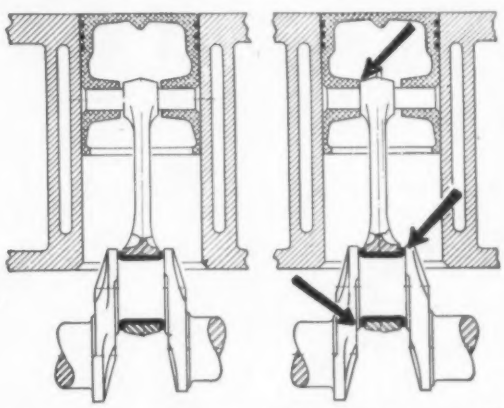


Fig. 4. Comparison of offset rod installation. Left, correct. Right, incorrect, resulting in excessive stress at points indicated by arrows.

with light thumb pressure. It will be serviceable if it slides into place freely yet without falling through of its own weight, when lightly oiled.

In aluminum pistons the pin fit is considered satisfactory if the pin will go in under light thumb pressure, yet does not drop through of its own weight (Fig. 8).

While all of the foregoing naturally has a direct influence on the success of a rod job, the condition of the crankshaft is most vital.

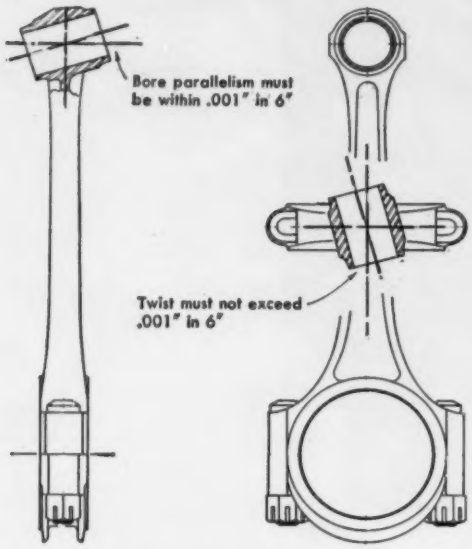
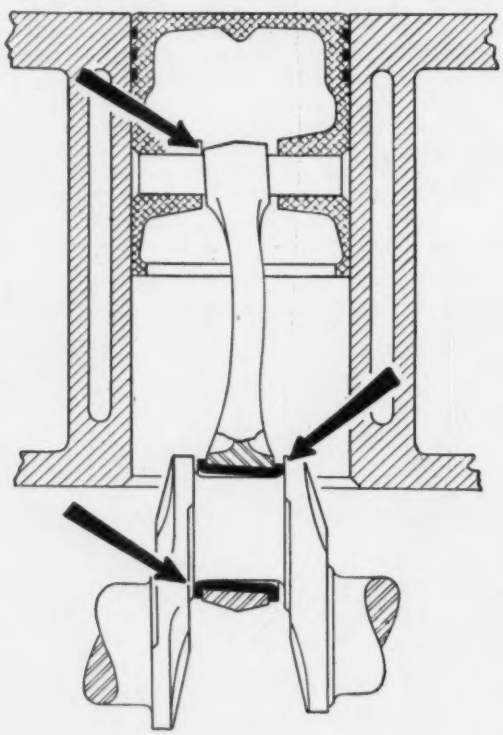


Fig. 5. Exaggerated view of connecting rods, showing lack of parallelism and the presence of twist, both of which affect bearing life.

Fig. 6. Below, bent rod with arrows indicating locations of excessive stress and wear on one side of upper insert; opposite side of lower insert.



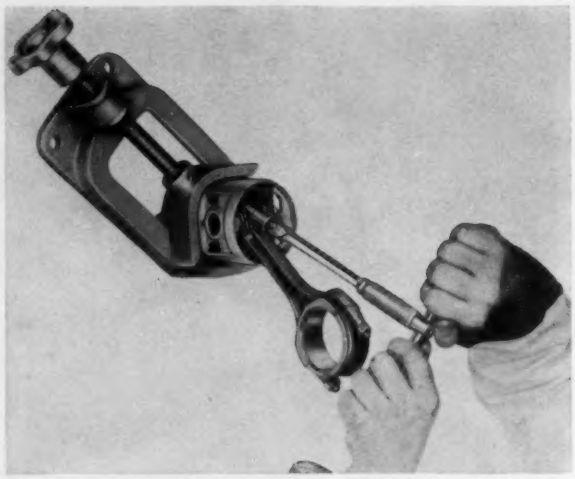


Fig. 7. Piston vise that protects rods from strain when loosening or tightening piston pin clamp bolt.

Crankpins should be checked with micrometers for out-of-round or taper. Obviously, a pin that is perfectly round is ideal; it is the best "foundation" for a good connecting rod bearing job. By the time rod bearings need renewing, some wear has occurred on the crankpin. Since pressures on the bearing and pin vary at different points of the stroke and on the various strokes, it is natural that the crankpin eventually goes out of round. Furthermore, since some rods are offset and some are even bent, crankpins become worn more at one end than at the other. The question then is, *"How bad can a crankpin be and still be serviceable?"*

MIKE ALL PARTS CAREFULLY

To check for out-of-round and taper, mike the crankpin diameter in two positions, 90 deg. apart. Do this at the front and rear of the pin. The differences between the front and rear readings in any one plane shows the amount of taper. The differences between two readings at each end of the pin will give the amount that the pin is out of round at that end.

Consider the pin to be satisfactory, if it is smooth,

Fig. 8. Checking piston pin fit, latter must not drop through of its own weight.

and the readings do not vary more than .0005-.0010 in. The condition is not really good, yet is passable, if the readings range between .001 and .002 in. Anything over that calls for reconditioning.

For the best job this would suggest removing the shaft and sending it out to be reground. Fortunately many jobbers with machine shops have crankpin refinishing tools. Usually they have experienced operators who will come to your shop and perform this specialized job. And there are many independent shops who have an eye to the future and an "appetite" for profits, who own and use both power and hand operated crankpin refinishing tools.

When a crankpin is refinished, it is machined enough to make it true, then enough more to bring it to a standard undersize.

Some engine manufacturers are a bit sensitive about referring to "undersize bearings." They prefer to refer to such bearings as "thicker wall bearings." Either way is OK, and everyone understands that when a shaft is damaged it must be refinished. And when metal is taken from the shaft, the shaft is undersize, and understandably the same amount of metal must be added to the bearing in order to maintain the correct oil clearances.

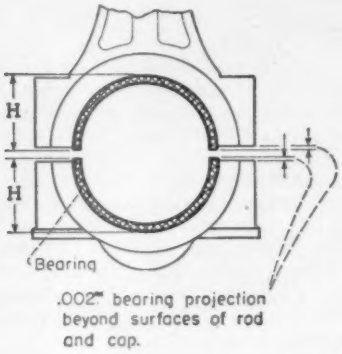


Fig. 9. How precision inserts are designed to assure tight fit in bearing bore.

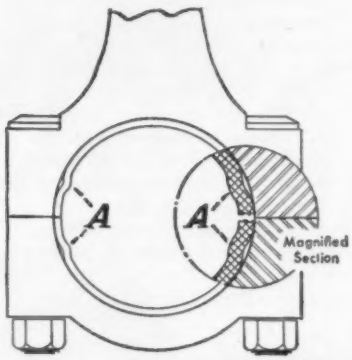


Fig. 10. Bearing insert damaged by being too tight in bore and causing buckling.

GIVE EXACT MEASUREMENTS

If you can give your bearing jobber the exact diameter of the shaft plus year and model of the car, he can provide you with precision inserts which when properly installed will give the correct, specified oil clearance. It's all a matter of teamwork between the shop and the jobber. Since he is as concerned with doing the job right for you as you are in doing it right for your customer, he will often come to your shop and take the necessary measurements on the shaft in order to get the correct bearings.

Precision bearing inserts are fragile. They can be no more accurate than the bearing bore in the rod and cap. If this bore is out of round, the installed bearing will be squeezed out of round. This is one reason why jobbers who handle bearings frequently urge that you let them check the bearing bore of each rod. They do more; in checking the rods for twist or bend, they frequently make the necessary correction by regrinding the bearing bore.

Specialists in bearing work have found that it is not always satisfactory to straighten a bent rod. True, it helps; but to get a rod straight, requires a bend that passes the elastic limit of the steel so that as the rod springs back it comes into alignment. It becomes a matter of fine judgment and experience to straighten rods. And it helps a little bit in this straightening job if "luck" is on your

Fig. 11. Left, back of bearing with arrow showing what appears to be a grain of sand. Fig. 12. Right, bearing surface with bearing metal melted away opposite the area lifted by the grain of sand.

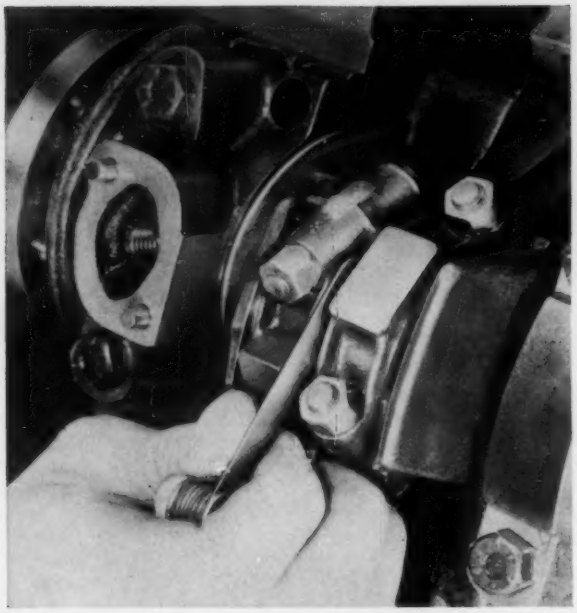


Fig. 13. Using feeler gauge to check connecting rod end play.

side. Otherwise under the heating and cooling and stress of engine service, the rods may "unlax" and go back into the original sprung condition.

Some urge that a badly bent rod be replaced with a new one. If you do this, however, be sure to check most critically the weight of this rod compared to the weight of the rod originally in the engine. Other authorities urge that if the rod is only very slightly out of true that it have its bearing bore reground to compensate for slight twist.

Bearings must fit *three* ways.

A fit that is just as vital as the oil clearance is the fit of the bearing insert in the bearing bore of the rod and cap. This must be tight, but not too tight. A firm fit is achieved by making bearing inserts so that they project .002 in. beyond the parting surfaces of the rod and cap, as shown in Fig. 9. This is called a crush fit. Note that the height "H" of the bearing upper half and lower half is engineered to give a tight fit; or seat between the bearing, the rod, and the cap. This is vital to prevent pounding, and also to assure good heat transfer.

DON'T OVERDO IT

This crush fit can be overdone, however. In a case of that kind, the precision insert may buckle or bulge, as in Fig. 10. This would result in reduced oil clearance, leading to lack of lubrication, overheating, and failure beginning in areas "A," Fig. 10.

It is not unusual to find that excessive crush is caused by dirt getting behind the bearing during the installation. That's why cleanliness in bearing work is so vital.

It is a wise mechanic who washes and blows bearing bores clean and who follows this up by equal care with inserts. Some mechanics at the risk of being considered overly fussy, wipe each surface with a clean facial tissue at the time of inserting the bearing.

What appears to be a grain of sand on the back of the bearing in Fig. 11 has lifted an area of the bearing, about the size of a thumb print and extending down to the oil hole, out of contact with the rod. In Fig. 12, which is the inside of the same bearing, it can be seen that serious bearing failure developed in this area where poor contact, or no contact, was made with the rod. Actually the constant spraying of oil across the rod is an important part of the engine *cooling system*, at least so far as the rod bearings are concerned.

So long as the bearings fit well in the rods and connecting rod end clearance is satisfactory on each crank throw you have little to worry about in connection with end play. It should be checked, however, with a feeler

(Continued on page 78)

Fig. 14. Plastigage in place on crankpin to check oil clearance between crankpin and bearing. Cap is torqued to specifications.

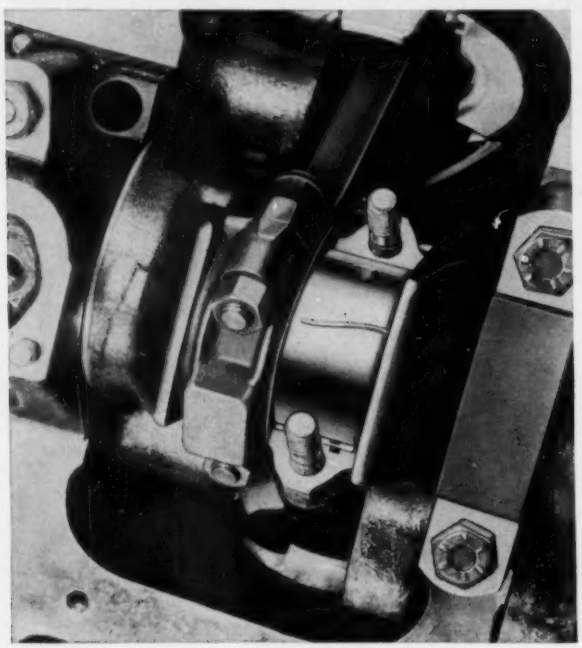
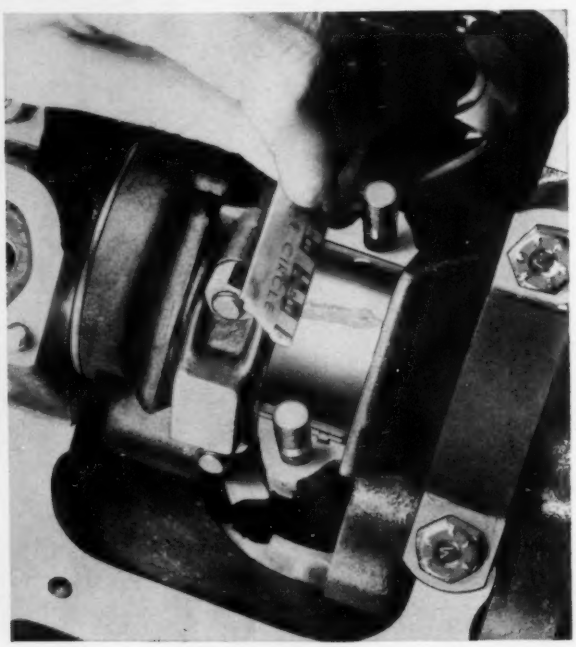


Fig. 15. Measuring oil clearance with printed gauge after plastic has been squeezed by tightening the bearing to normal torque.



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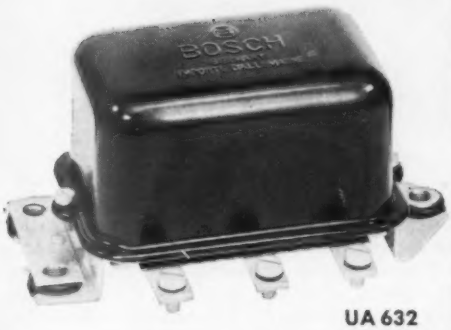

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Servicing suspension systems

Wheel balancing, front-end alignment and front-end overhaul, make up a major area of profitable work. But to cash in properly . . . with benefit to both shop and customer . . . takes know-how, craftsmanship and proper equipment. Here are the basics for doing the job right, and very likely, far more often.

Part III—Torsion Bar Suspension

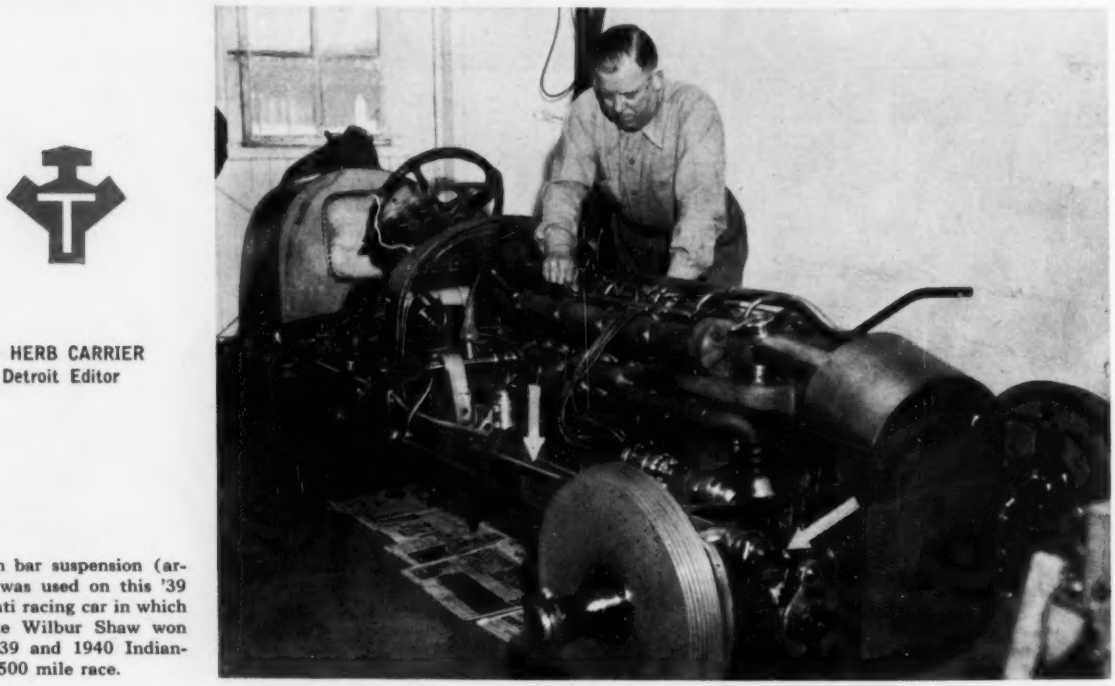
• THE 1950's COULD be termed the "age of suspension" for the automotive industry. Time was when front end suspension automatically meant a king pin and bushing set up. This type suspension gained public acceptance and remained popular for many years. In the early 1950's, however, a new type suspension was introduced and quickly swept the industry — the ball joint suspension.

Ball joints seemed to be just the trigger needed to set off a whole chain of front suspension inventions and innovations. Ball joints are apparently here to stay for quite some time. Several major suspension changes also have been introduced, which successfully use the ball joint as a fundamental front suspension component.

One of the well-known new systems brought out about midway through the decade used torsion bars in conjunction with the basic ball joint. This system, called torsion bar suspension, is a shining example of clean, modern, functional engineering. Because it was a somewhat radical break through from the standard coil spring front end suspension, many thought torsion bar suspension would prove an exceptionally fertile bug hatchery. Such was not the case. Instead, torsion bar suspension is probably the least troublesome front suspension system currently being mass produced in this country. This, of course, is another big point in its favor. Torsion bar suspension, too, had been used for some years in European cars — the Maseratti race car, for example.

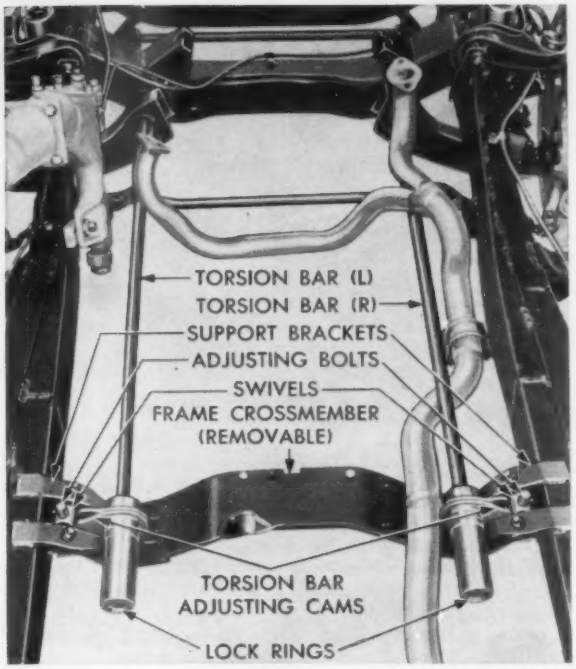
BASIC CONSTRUCTION

The torsion bar front suspension as used on Chrysler Corporation cars consists of two torsion bar springs (right



By HERB CARRIER
Detroit Editor

Torsion bar suspension (arrows) was used on this '39 Maserati racing car in which the late Wilbur Shaw won the 1939 and 1940 Indianapolis 500 mile race.



A typical, simple, well-designed torsion bar suspension system, as used on Chrysler Corporation cars. Adjusting bolts at the rear bracket assemblies permit easy vehicle leveling and height positioning.

and left hand), two sets of upper and lower control arms, four ball joints, and two struts. No leaf or coil springs are used anywhere in the front suspension. In appearance, the torsion bars look like solid metal rods several feet long and hardly more than an inch in diameter. Each end of each bar is formed in the shape of a hexagon.

The front ends of the bars are anchored to the lower control arms at their pivot points. The rear ends are connected, through adjustable anchor and cam assemblies, which are supported by brackets welded to the frame side rails and a removable crossmember.

The upper control arms are conventional in design, and serve to connect the steering knuckle to the frame side rails. In late model vehicles, the upper control arms are mounted on removable brackets, which, in turn, are connected to the frame. Shim packs inserted between bracket and frame serve as a means of establishing the correct caster and camber adjustments.

The lower control arms are attached to the front frame crossmember by means of a pivot shaft and bushing assemblies. The outer ends of the lower control arms are connected to the lower ends of the steering knuckles through the lower ball joints. Conventional shock absorbers are mounted between the lower control arms and the frame.

Struts are used—one on each side of the vehicle—to prevent fore and aft movement of the lower control arms. The struts act as braces, and are connected to the number one frame crossmember, at the front, and the lower control arms, at the rear. The strut mountings in the cross members are made through replaceable rubber bushings. The rear end of the struts are securely bolted to the lower control arms.

OPERATION

Torsion bar suspension relies upon the twisting ability of metal rather than its compressability to absorb road shocks and deliver a smooth, even ride to the car. Either method, twisting or compressing, takes advantage of the inherent elasticity of the metal used. A coil spring will bounce back to its original shape after being stretched or compressed. It will continue to do this until it's either forced past its elastic limits, or it gradually undergoes a form of metal fatigue. When this happens to an automobile front suspension coil spring, the front end sags, or settles, and road clearance becomes less than design height.

In torsion bar suspension, the "springing" action is the twisting of the solid metal bar. Because the bars are firmly fixed at one end (the rear), and free to pivot at the other end (the front), any up or down movement of the lower control arms delivers a twisting motion to the bars.

The bars are free to operate independently of each other. On some installations, however, a stabilizer—or sway bar—is used to connect the struts to the frame through links and bushings. This general type of sway bar is common to most all vehicles built in the U.S. Individual hook-ups might vary from make to make, but in appearance and operation they are fairly identical.

In effect, their purpose is to tie the lower control arms together so that any movement of one control arm exerts an influence on the other control arm. In this manner, the stability of the vehicle is improved. Not all Chrysler built torsion bar vehicles are equipped with sway bars. Some mechanics, and even some customers, have insisted the factory "goofed" when they find a torsion bar vehicle without a sway bar. Those that do not have sway bars were designed to operate efficiently without one. Usually, attempting to add a sway bar is a waste of time and money. The cost involved in parts and labor will not be justified by any change in handling characteristics.

On the other hand, if the system has a sway bar, it should never be removed and discarded. Rarely can well designed structures be improved by the subtraction of a functional component.

ADJUSTMENTS

An outstanding feature of torsion bar suspension is the built-in adjustment bolts which permit quick, accurate vehicle leveling. These bolts, one for each torsion bar, are part of the anchor and cam assemblies which attach the rear ends of the torsion bars to the cross member and frame.

Several tools and gauges are available to facilitate checking vehicle height and level, but if such equipment is not on hand the same checks and adjustments can be made by using a conventional steel rule.

To check the front suspension height and level by the steel rule method, place the car on a level spot on the floor. Be sure the tires are inflated to the recommended pressure and that the gas tank is full. There must be no load or passengers in the car. Bounce the car, front and rear, to relieve all bushings and connections of any undue strain or bind.

With the stage set as above, measure the distance from the floor to the lowest point of the lower control arm ball joint. Be sure to hold the steel rule as vertical as possible while making measurements. Record the reading on a piece of paper.

Move the steel rule inward toward the center of the car and take a distance reading from the floor to the underside of the lower control arm bushing housing. Take this reading at the center line of the lower control arm. Record the measurement.

The difference between the two readings should not be more than 2-5/16 in., or less than 2-1/16 in., and the greatest distance should be the one from the bushing housing to the floor.

(Note: This adjustment differential is only pertinent to 1958 Dodge sedans and coupes. Dodge Suburbans should be not more than 2-13/16 in., or less than 2-9/16 in. All

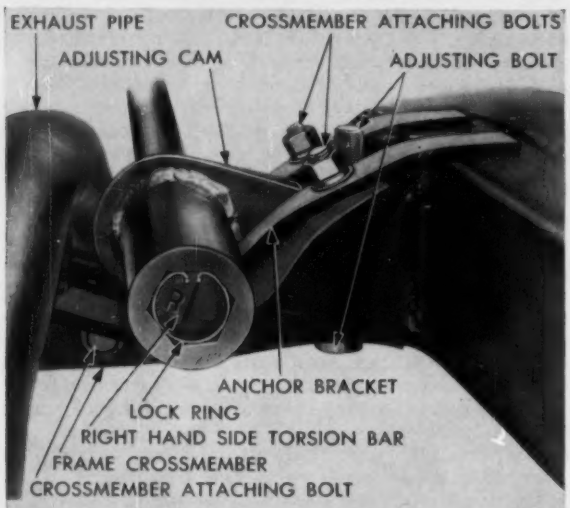
Dodge sports models should be not more than 1-13/16, or less than 1-9/16 in. For other Chrysler built cars, check the specifications put out by each Chrysler Division.)

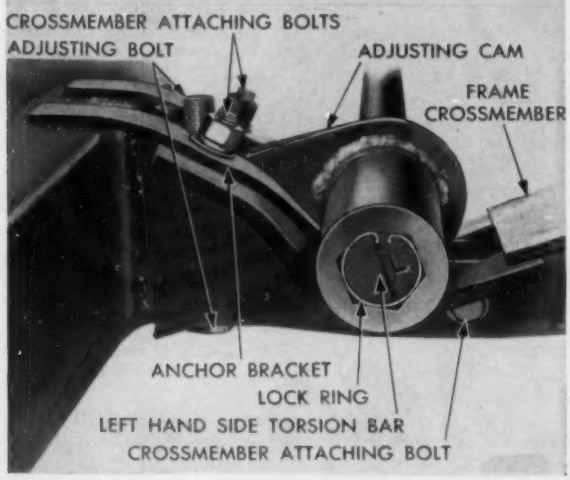
If any measurement is more than ⅛ in. above or below specification, an adjustment is necessary. However, no adjustment should be made until the other side of the vehicle has been measured and recorded in an identical manner. The readings taken from both sides should be within ¼ in. of each other to be acceptable. If individual side readings are more than ⅛ in. out of specs, or if the comparative readings show more than ¼ in. difference, proceed with the leveling adjustment.

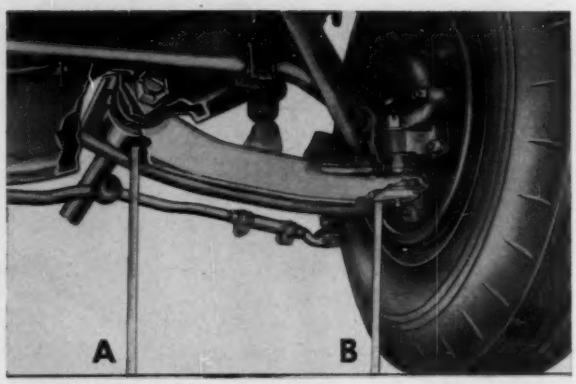
To adjust, merely turn the adjusting bolt located between the two upper attaching bolts which hold the cross member to the brackets welded to the frame side rails. From underneath the adjusting bolt has a hex head so that it can easily be turned with a suitable socket. To secure the correct level and height adjustment, loosen or tighten the bolt as necessary. After turning the bolts, again bounce the vehicle before re-checking the height and level.

Tool number C-3608 makes it possible to check the height on both sides and the difference from side to side

Torsion bars are not interchangeable from right to left. Bar identification is stamped on the end of each bar, and is either "r" (right), or "l" (left). When installing a torsion bar, make certain the retaining lock ring is firmly seated in its groove.







Front end car height can be checked with a steel rule. Two measurements are taken on each side of the car. For height, measurements are compared with manufacturers specifications. For level, measurements from one side are compared to measurements from the opposite side. Both height and level should be adjusted at the same time.

in one easy operation. A shop doing any appreciable amount of work on torsion bar equipped vehicles will find the purchase of this, or a similar, tool a profitable, time saving investment.

When using an adjusting tool of this sort, the vehicle must be prepared for the check-out in the same way as it was for the steel rule measurements. That is, the floor must be level, the vehicle unloaded, and the tires properly inflated. The bouncing procedure must also be followed.

Occasionally, only one side of the vehicle will require adjustment. However, adjusting one side will affect the adjustment on the other side. Therefore, adjust the side which is most out of specs, bounce the vehicle and recheck reading before making further adjustments. It may help to bear in mind that turning the adjusting bolts clockwise will raise the vehicle, and counter-clockwise will lower the vehicle. It's also good practice to check the caster and camber readings after making any height and level adjustment.

CASTER AND CAMBER ADJUSTMENT

As in most ball joint suspension vehicles, torsion bar suspension cars built by Chrysler use shims placed between the upper control arm support brackets and the frame side rails. Shims are available in thicknesses of 1/16 and 1/32 in. Shims affect caster and camber as follows:

1. Adding shims to the front bracket or removing shims from the rear bracket will decrease positive caster.

2. Removing a 1/16 in. shim from one bracket and adding the same thickness shim to the other bracket will change caster approximately ¾ of a deg. without changing camber.

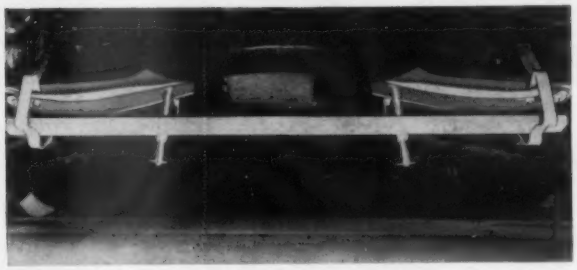
3. Adding equal shims at both brackets will reduce positive camber. A 1/16 in. shim added to each bracket will change camber about 5/16 of a deg. without changing caster.

The total thickness of each shim pack should not exceed 9/16 in. If correct alignments can not be obtained without exceeding this size shim pack, it indicates that some parts of the suspension system have become damaged or bent, and must be replaced. No attempt should be made to straighten these parts either cold or by applying heat. Heat is especially harmful in that it destroys the original structure of the metal that was obtained by factory heat treating.

Because vehicle height and level have such a direct bearing on front end alignment, any adjustment to one

must be accompanied by a complete check out of the others.

Toe-in is controlled and adjusted in the conventional manner by varying the length of the tie rod tubes. When loosening the tie rod clamps to permit a toe-in adjustment, be sure to replace the clamps and the clamp bolts so that they will not cause steering interference by the bolt heads striking the frame. Allowances should be made



Tools which are available permit the measuring of both sides of the car in one operation. Tools of this type speed up the check and adjust procedure. Even a comparatively small volume shop will find them a good investment in promoting speed and accuracy.

for adequate clearance between bolt heads and frame even when the vehicle is jouncing over a rough surfaced road. Proper clearance when the vehicle is level and stationary may not be sufficient when the front end negotiates sharp up and down motion.

It's also important to maintain steering wheel straight ahead position while making toe-in adjustments. If after establishing correct toe-in adjustment, the steering wheel is off center, turn both tie rod tubes an equal amount in the same direction until the wheel is properly centered. Then, relocate and retighten the rod clamps.

TORSION BAR REPLACEMENT

To replace a damaged torsion bar, place a floor jack underneath the number two frame cross member and raise the car until both front wheels clear the floor. Back off the adjusting bolt to release the load from the torsion bar. *Remove the bolt and the swivel.* If only the bolt is removed, the swivel may fall inside the welded frame bracket.

Remove the lock ring from its groove. This ring controls the torsion bar end play. Do not overstrain the ring during removal. If the ring becomes stretched, twisted, or otherwise damaged, replace it with a new one during installation.

Grasp the bar about midway of its length. Slide it toward the rear of the vehicle until it slips out of its seat in the lower control arm shaft. Allow the bar to drop downward several inches to clear the control arm. Then, slide the bar forward to slip it out of its rear anchor, and remove the bar from the vehicle.

To replace the torsion bar, coat the hex ends of the bar with light grease or Lubriplate. *CAUTION:* The torsion bars *are not* interchangeable right to left!! While applying the lubricant to the rear hex, double check the stamped marking on the end of the bar. Bars are marked either R or L to signify right and left. Bars marked R should only be installed on the right side of the vehicle, and vice-versa.

After making sure the bar being installed is the correct one for that side of the vehicle, slide the hex into the rear anchor. Twist the bar until the anchor cam is positioned as close to the floor pan as possible. *This is important.* If the cam is not located in this manner, it will be impossible to obtain the correct height adjustment.

With the cam held as close to the floor pan as possible, slip the front hex into its seat in the lower control arm. Work the bar forward and back to make sure full contact is made at the anchor and arm shaft. Then install the lock ring securely in its groove.

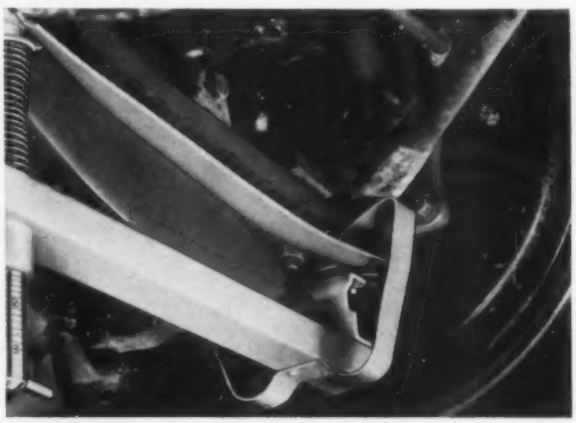
Position the swivel on the anchor cam, and install the adjusting bolt and seat. Tighten the adjusting bolt until about 1 in. of bolt threads are showing out of the swivel. This is the basic setting from which the final height and level adjustments are made. This initial tightening also loads the bar sufficiently so that the vehicle can be safely lowered to the floor.

After any major service to the suspension system, such as replacing a torsion bar, it's very necessary to check and adjust the vehicle height, level, and front end alignment.

The remaining components of this type of torsion bar suspension are serviced much like any other kind of ball joint system. The ball joints themselves are threaded into the control arms. The ball joint studs are tapered to fit snugly into the steering knuckles. Stud nuts and cotter pins are also used to retain the studs in the knuckles. Removing the ball joints is relatively simple. To remove the upper ball joint, merely raise the vehicle and remove tire and wheel as an assembly. Remove the cotter pins and the stud nuts. Position a threaded spreader (tool number C-3564) over the lower stud so that it rests on the steering knuckle. Run out the upper section of the threaded tool until it bears firmly against the stud of the upper ball joint.

With a wrench, spread the tool enough to place a load on the upper stud. Then strike the steering knuckle with a heavy hammer to jar the stud loose. Remove the tool, ball joint dust cover and grease seal, and unscrew the joint from the upper control arm. A special tool is available (tool number C-3560) which makes it easy to unscrew or tighten the joints in the control arms.

The lower ball joint can be removed much the same way except that the tool is reversed and the vehicle is raised by placing the floor jack under the lower control



Correct positioning of a height and level checking tool is important. Several types of tools are available, but any type must be securely snapped in the proper position if the final reading is to be accurate. It's also important to make all adjustments and measurements with the vehicle resting on a level floor.

arm as close to the wheel as possible. Installation is simply the reverse of removal. It's a time saver to give the replacement ball joint a shot of grease before installing it. This saves a trip to the grease rack after the job is all buttoned up.

(Continued on page 77)

"So you want to open a service shop?"

It's like leaving home to "go on your own" the first time. Here's "boot training" for the ex-salaried-employe embarking on the tossing seas of independent enterprise.

Part IX—Closing the Sale

By HERB CARRIER, Detroit Editor
and
DR. GEORGE A. FIELD, Wayne State University

• SALES SITUATIONS have many different beginnings, but to be successful they can have only one ending—the close. If the sale isn't closed, then, naturally, a sale has not been made.

It's not uncommon to hear some salesmen say, "I'm a pretty good salesman, but I can't close." It's obvious that those who make this remark are not really salesmen. They may have a sales personality, and be able to uncover needs and awaken desires, but they are wasting a major share of their efforts if they don't follow through with an efficient close.

Selling can be likened to driving a golf ball. First, the golfer addresses the ball (greeting customer). He waggles a bit to get comfortable (making friendly conversation). Then, he starts a slow, deliberate backswing (backing up to allow customer to talk). At the top of the backswing, he starts a powerful, well-aimed downswing designed to whack the daylights out of the unsuspecting ball (coming back at the customer with a sales pitch designed to overcome all possible objections). He smacks the ball, and **follows through** with his swing to set the ball straight on its way toward the pin (making the sale by following through with a successful close).

FOLLOW-THROUGH IMPORTANT

Omitting any one step in the technique of driving a golf ball, or skipping steps in the technique of making sales, usually means unsatisfactory results.

It's generally agreed that the follow through is the most important part of a good golf swing. It's also an accepted fact that a good closer will make sales. The shop owner who can get the customer's name signed to a repair order is a good closer. He **must** be if he is to continue being a shop owner.

The most friendly, kind, considerate, helpful shop owner in the world can get into real financial trouble if he doesn't know how to close a sale. It's important to become expert in all phases of salesmanship, but it's especially vital to be a good closer.

Some very rich salesmen are extremely good at closing sales. Such salesmen can virtually write their own tickets. They are vitally needed assests to most every kind of business. Take used car lots, for instance. Some high-volume lots employ a number of cracker-jack salesmen, but they also employ an ace closer. If the salesmen can close their own deals, fine. If they have a hot prospect who appears to be on the verge of buying, but just won't sign the paper, the salesman refers the prospect to the "Boss" (actually the closer) to "See if he can work out a better deal for you." Once in the hands of the closer, the prospect almost invariably becomes a customer.

In this kind of a set up, the closer's time is much too valuable to be spent separating the lookers from the buyers. Less efficient salesmen are used for this purpose. True, the salesmen provide a valuable service by uncovering needs, awakening desires, etc., but without the help of the closer to deliver the follow through, the percentage of closed deals would be much less. If you really want to see a super-craftsman at work, watch a used car closer in operation. If, in your own business, you come close to duplicating the skill of a closer, your biggest worry will be finding a reliable boy to carry the money to the bank while you are busy closing more sales.

CLOSING CAN BE LEARNED

Like so many other things in business, the art of closing sales can be learned. Individuals don't seem to be born with the closing techniques; so obviously they learn them. However, knowing the proper technique is only good if the technique itself is applied regularly on each and every customer.

NOT HIGH PRESSURE

There's real danger in over-selling. Putting the pressure on a prospect in an attempt to close the

sale is a common error. It's important to keep the pressure well concealed, but constantly working for you. The real pressure is the desire to buy that you awaken in the prospect. If you suspect he feels as if he's being pushed into buying, he's being high pressured. It's the salesman's job to be enthusiastic about his products, but relaxed in his attitude. The prospect is the one who is supposed to get excited about making a purchase.

It's somewhat like using an impact tool. The mechanic just pulls the trigger. The tool does the work.

USE CARD GUIDE

Because all selling situations and all salesmen are different, there are no set ground rules. There are only general rules which apply across the board. What works best for one salesman in his particular situation may fall flat for another man in a similar situation. The closing technique hinges heavily upon individual personality. Therefore, it's important to know what works best for you.

The way to do this is to keep accurate records of how you actually closed sales. A convenient method for doing this is to list the closing techinque for every type of sale on a separate file card. In this way, you soon learn your best closing pitch for the many products and services you have for sale.

Make it a habit to work with cards. After a particularly big sale, ask yourself which closing technique seemed to turn the prospect into a customer. Check this with the notation on the card which covers this type of sale. Is it the best technique? Could you have presented it a little bit better? Could you add a new twist that would make your closing pitch all the more effective? By conscientiously using the file cards as your closing guide, and by constantly improving on the successful closes, you can incorporate your most effective closings into a tightly knit selling habit. Once this happens, your number of sales is bound to increase.

The same card technique can be used to record the closing pitches which weren't successful. When a hot prospect appears to be right on the edge of buying, but then backs away, make a note of the way you tried to close the sale. Quite likely the reason for the lost customer was something you said — or something you didn't say, but inferred. Knowing what not to say can be just as important as knowing the right thing to say. It's like a General who studies his enemy so that he will know what not to do.

WATCH FOR SIGNALS

Some would-be salesmen think they must wait until the exact psychological moment to try to close a sale. This theory has been almost universally debunked. An hour glass or a stop watch may be fine for boiling eggs, but they aren't recommended for closing sales.

THE TRIAL CLOSE

One of the most basic techniques is the trial close. This is simply an attempt to close. By suggesting that the customer buy, early in the sales

(Continued on following page)

Practice the trial close as a way to avoid overselling. All too often, the salesman who does all the talking makes, then unmakes the sale without pausing long enough to take a deep breath.

One form of the "assumptive close" is suggesting that the mechanic get right to work on a needed job. Few prospects resist becoming customers when wheels start turning in their behalf.

pitch, you either make a fast sale, or you uncover areas that need additional effort. In effect, the prospect sends out a signal to let you know where to go to work. If, for example, you're selling a can of polish to an interested prospect, you might quickly outline the reasons why the polish would be especially good for his purpose, then follow this with a trial close. If he buys, fine. If he doesn't, he'll usually offer up some kind of objection which you can go about overcoming.

Follow every sales effort with a trial close. Don't be obvious, but don't leave any doubts about your willingness to ring the cash register right now. A trial close is also insurance against over-selling. Some prospects are sold and unsold before the salesman gets into his closing pitch. Waiting for the precise psychological moment before attempting to close may work fine for a highly talented man who has refined his selling technique down to a pure science, but for most successful salesmen it's too risky.

CLOSE ON OBJECTIONS

Another excellent technique is to close the sale after overcoming an objection. The prospect voiced the objection to defend himself against parting with some of his money. Most objections are sincere and logical. When you successfully overcome the objection, the prospect is defenseless. Your counter-punch must be more skillful than his objection. Therefore, it is more logical to buy than not to buy. By offering up objections the prospect at least is interested in what you are saying. By further arousing his interest, and in stirring up his desire to buy, you are greatly increasing your chances of ultimately closing the sale.

CLOSE ON QUESTIONS

Occasionally, the most effective close is one that ends with the salesman asking a question. Usually the question should be one that automatically requires a yes answer from the prospect. "Of course, you want your car to be safe, don't you?" is a typical closing question. Any normally honest prospect can't help but answer yes to a question of this sort. It's very important not to use this type of question to embarrass the prospect into buying. Your tone and manner must indicate clearly that you asked the question only to be friendly and helpful. Improper emphasis could irritate the prospect. Badly presented questions can lead to arguments which invariably kill any chance of making sales. For this reason, it's usually best not to use a question as an early trial close.

It's rare when a single question will close a sale. More often sales are successfully closed after a series of questions, each of which requires an agreement or an outright yes answer. By getting the prospect in the mood for answering "yes," you make it easier for him to say yes to your closing pitch.

USE THE ASSUMPTIVE CLOSE

Some prospects find it easy to buy when the salesman obviously assumes they will buy. For instance,

a definite preparation to go ahead with needed repair work is an overt demonstration that the job is urgent enough to require immediate attention. The prospect may not be too certain of the need for on-the-spot service, but the salesman's preparation to perform the work indicates that it's a minor emergency that must be handled at once. "Hey, Joe, put a new fan belt on this Ajax Special, and make it quick. Mr. Jones is going to wait while you do it," is a classic method of slipping into an assumptive close.

If Mr. Jones objects to being tied up even for a short time, this is overcome by offering to drive him where he is going, or to deliver the car when ready. If there is not enough money in the job to warrant the road time, the next best thing to do is to attempt a definite appointment to do the job as soon as possible. In this case, make it absolutely clear that you are reserving special time strictly for the servicing of Mr. Jones' car. He'll appreciate the personal treatment, and will find it difficult to turn down your offer to help him out of a tight spot.

By all means, **avoid** suggesting casually that he "stop in sometime." Set a specific time, keep your word, and in almost every case the customer will keep his.

USE ACTION TO CLOSE

A clutch in the hand is worth two in the bush. An automotive clutch, that is. Maybe this isn't a very good example, but the theory applies. Pointing at a cold, black tire way up on the shelf is not the way to close a sale. It's wise to be calm and relaxed, but don't over do it. Get the tire down. Bounce it on the floor. Turn it over. Show the prospect the tread, the casing, the size. Let him feel it, smell it, want it. Put some action into your close. It's awfully hard to sell by remote control. It's much harder for the prospect not to buy when he's got the merchandise at his feet or in his hand.

When using this technique to sell repair work, write out the order as soon as you are reasonably sure the prospect will buy. Get just the basic order written down, then hand him the pencil so he can sign on the dotted line. The sooner he signs, the sooner you can "get started" fixing his car. Time is important. Most people like to do business with people who show a little action.

It's possible to waste a few repair orders by having prospects refuse to sign, but the gamble of losing a few cents' worth of paper against the chance of landing a profitable repair job is a pretty sound bet. Especially when you uncover the need, awaken desires, and overcome objections sufficiently enough to feel there is a strong possibility of closing the sale.

USE TRUE STORIES TO CLOSE

Relating true stories can be applied as a closing technique as well as in overcoming objections. Clip articles from local newspapers that tell about things which happen to people who drive cars that need the same kind of service the prospect's car needs. Make sure he knows you are showing these clippings not to scare him into buying, but to show him what has happened to others whose servicemen weren't as thoughtful and considerate of their customers as you are of yours. Above all, don't harp or preach safety and car owner obligation. Be considerate, not dictatorial.

In a nutshell, the art of closing sales rests upon the salesman's ability to ask for the sale. Wrapping your request for a sale with logical reason, or reasons for the prospect to buy, could be termed your closing technique. These techniques are comparatively simple; and once mastered and practiced they are sure-fire methods of increasing your average number of closed sales.

Get it in writing as soon as possible! Don't jump the gun of course—but don't lag either in indicating that necessary work should be done at once. Risking the waste of an order form is well justified when there's a chance to land the repair job.

Repositioning Choke Wire Conduit Aids Cold Engine Starting

To facilitate starting the engine of the Studebaker Scotsman and Y1 models which are equipped with a manually operated choke, the factory suggests the following:

1. The choke wire conduit end should be adjusted or positioned so that the end of the conduit is 1 to 1⅛" beyond the conduit clamp. Repositioning the conduit in this manner will provide a stop for the choke which prevents locking the choke valve when the choke control is fully out, and allows the choke valve to move sufficiently to permit air to enter the carburetor and minimize flooding.

2. Whenever the engine is started, the accelerator pedal should be depressed so that the throttle valve is ¼ to ½ open.

Say You Saw It In Automotive Service Digest

The aluminum engine and

Interview*

By BEN M. IKERT
and
HERB CARRIER

JAMES M. SMITH was graduated from Rensselaer Polytechnic Institute, Troy, N. Y. in 1929 with the degree of Mechanical Engineer and received the degree of Master of Mechanical Engineering in 1935. From 1929 to 1938 was a member of the faculty of Mechanical Engineering Department of Rensselaer Polytechnic Institute. He was with Mack Trucks, Plainfield, New Jersey in Engine Design and Development from 1939 to 1944. From 1944 to the present, he has been with the Aluminum Company of America at Cleveland, first in charge of the Engine Laboratory and presently, Manager of the Automotive Engine Section, Development Division, Cleveland Works. Member of Society of Sigma Xi; member of Society of Automotive Engineers; Licensed Professional Engineer, New York State.

• WILL MOTOR VEHICLES coming off production lines in the foreseeable future be equipped with aluminum engines? Many behind-the-scenes developments throughout the automotive and allied industries indicate that it is well on its way.

Aluminum engines, as such, are not new. History has it that as far back as 1896, the pioneer Elwood G. Haynes made use of aluminum alloy in the engine of this early vehicle. Several six-cylinder cars of 1924 vintage were powered by aluminum engines and performed well for that day. Other attempts were made to promote aluminum engines but because of technical and economic problems they failed to reach the production stage.

In more recent years aluminum engines were generally made with a ferrous liner or chromium plate coating for the cylinder bores.

Because the advantages of aluminum are many, concentrated effort is now being directed toward its more abundant use in replacing ferrous metal which, up to now, has been suitable.

Obviously, aluminum results in a marked reduction in engine weight. Blocks and heads can be cut 100 to 150 lbs. in weight if made of aluminum instead of cast iron. Thus, a recent prototype aluminum block weighs but 90 lbs. in contrast to cast iron's 220 lbs.

WHAT'S THE SERVICE PROBLEM?

To obtain straight off-the-cuff answers to what typical service-procedure problems a shop mechanic may encounter with aluminum engines, we turned to a company with a wealth of experience in research and development of this versatile metal.

To that end, James M. Smith and Richard M. Smith, Automotive Engine Section, Development Division, of the Aluminum Company of America answer some of the basic questions about aluminum engines as they may affect the shop mechanic.

* * *

Question: Will water impurities in various sections of the country tend to have unfavorable reactions with aluminum castings?

Answer: Waters which are suitable for use in engine cooling systems will be satisfactory for aluminum engines.

In some waters, certain corrosion inhibitors in some commercial anti-freeze solutions promote galvanic attack of aluminum parts coupled with iron. Inhibitors are not necessary to prevent corrosion of aluminum cooling system parts. When they are essential to reduce rusting and scaling of iron parts, the addition of 1 per cent by volume of Naphthenic base soluble oil will accomplish the desired result without harm to aluminum.

Q: Will existing tools (boring bars, hones, reamers, etc.) be easily adaptable to aluminum, or are the machining problems considerably different between aluminum and cast iron?

A: The majority of the aluminum alloys which might be encountered in aluminum engines have

*One of a continuing ASD feature series.

the service mechanic

RICHARD M. SMITH was graduated from Purdue University in 1943 with a BSME degree. He served three years in the U.S. Navy as Engineering Officer on a destroyer and joined the Aluminum Company of America, Cleveland Development Division, in late 1946 as a Laboratory Technician in the Stress Analysis Laboratory. He was advanced to Project Engineer in Transportation Section in 1947, dealing with developments and applications of aluminum in the heavy truck and bus field. Since 1950 he has been in the Automotive Engine Section developing applications of aluminum in both the automotive and small engine fields. Member of Society of Automotive Engineers.

excellent machinability. However, those alloys containing large amounts of silicon are abrasive to carbon steel and high-speed tools, and should be machined with **carbide** tools.

To maintain dimensional accuracy, it is essential to keep the work cool. Dry machining operations are often accomplished satisfactorily on aluminum when the speeds are great and the feeds and chips are moderate. Most of the generated heat leaves with the chips and the work and tools remain cool. When heavy cuts and feeds produce excessive heat, a cutting compound that is essentially a coolant should be used to produce the best results. The following practices should be carefully observed with respect to lathe and boring bar cutters:

(1) Grind more rake on the cutting tool than is common for machining steel.

(2) Keep cutting edges sharp and free from burrs or wire edges by hand stoning.

(3) Employ high machining speeds, moderate feeds and depths of cut.

Drilling—The standard type twist drill performs satisfactorily in aluminum but better results can be obtained with high spiral drills. Flutes should be polished smooth and cutting edges honed to remove all burrs.

Honing and grinding—Manufacturers of standard honing and grinding equipment have stones and cutting oils for aluminum and should be contacted for their recommendations.

Reaming—Most of the different types of reamers may be used for aluminum. Spiral-fluted reamers produce better results than the straight flute. Flutes should be smooth and large enough to pass chips readily. The cutting edges should be finished by honing.

Threading—Hand and machine taps of ground thread type will produce smooth accurate threads in aluminum if they have flutes that are undercut to provide a top rake of from 10 to 20 degrees at the leading edge.

Q: Will poor maintenance or service variables be magnified, or will they be as tolerable as with cast iron engines?

A: No, if the shopman is educated in aluminum. There should be no difficulty in maintaining the present excellence of shop standards. Aluminum is relatively softer than cast iron and care should be exercised in handling aluminum parts to keep gasket surfaces nick and scratch free. Use of the torch should be judicious, to avoid overheating the aluminum alloys, which would cause distortion and also destroy mechanical properties.

Q: Do you think the anticipated aluminum engines will be introduced all in one model year—across the board—or do you feel that they might first be introduced in small cars reportedly being developed?

A: It is not likely that a complete changeover will occur in one model year. The application of

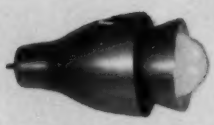
(Continued on page 70)

AC SELLING SLANTS

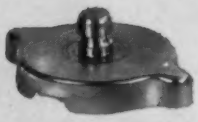
MONEY-MAKING FACTS

AC helps you see with THE NEW "SERVICE LIGHT" PROMOTION

...to lighten your work



DUAL ALUMINUM SHADE! This AC feature eliminates the danger of burns to the user.



RADIATOR CAP ADAPTER! The AC Service Light can be instantly installed on the radiator of the car for convenient under-the-hood illumination.

UNIVERSAL ADAPTER! Easily mounted on creeper or work bench, the AC Universal Adapter provides on-the-spot lighting.

Order any 48 AC Spark Plugs Now!

First, you'll like what you see about the AC Service Light! It's designed with you in mind so you can use it in any number of convenient ways . . . on the car . . . on the creeper . . . on the work bench! It comes complete with two adapters and a full 18 feet of extension cord, and it works equally well with standard or heavy-duty light bulb. The long, flexible "gooseneck" of the AC Service Light swivels 360° and is vinyl coated to protect it from dirt and grease.

It's easy for you to own and enjoy the AC Service Light! Just order *any* 48 AC Spark Plugs and you can receive the Service Light *plus* eight type #46 AC Spark Plugs worth $8.24! The sale of the 8-pac pays for the promotion package.

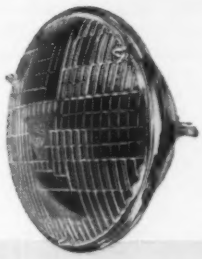
AC SPARK PLUG ⚛ THE ELECTRONICS DIVISION OF GENERAL MOTORS

OF THE MONTH !

FOR DEALERS

You'll sell more Headlamps when you have

these **GUIDE** T-3 *Powerbeam* **50**



HEADLAMPS

With older seven-inch lamps, potential road hazards are not sharply defined.

New Powerbeam 50 Headlamps clearly show warning sign, bridge abutment and other roadside hazards.

The ideal replacement for 2-headlamp cars!

Now, when days are short and nighttime driving hours are the greatest, be sure you have Guide T-3 Powerbeam 50 Headlamps in stock. Don't miss sales.

Call every 2-headlamp system car owner's attention to the new, improved headlamp. Tell the owner this new lamp increases safety with *more* light—*aimed* right . . . He gets 50 additional feet of light on lower beam alone . . . He gets full 50-watt light strength on *both* upper and lower beam.

This is the right light. It's mechanically aimable even in daylight. Brings dual-lamp system benefits to owners of older cars. Get the extra business.

AC

CALL YOUR REGULAR AC SUPPLIER TODAY!

Pride of workmanship and making the best of one's native ability are the best guarantees of repeat business . . . of winning and keeping customers . . . assuring advancement and higher earnings. These are the rewards for understanding and applying the . . .

Elements of Automotive Craftsmanship

By GUY WETZEL
Technical Editor

• AUTOMOTIVE CRAFTSMANSHIP MIGHT BE described as a combination of the desire and the ability to do a mechanical job in strict accordance with the best practices. As the basis of this ability, the true craftsman has a thorough understanding of the principles involved in his work, plus knowledge of the most suitable methods, tools and equipment.

Mastery over the work he does removes this individual from the ranks of those who "want to get out of the automotive service business." He is not a victim of the "other fields are greener" fallacy, which in many cases is the true reason for believing one's interests and skills would be more appreciated and rewarded in a different industry or line of work.

No one has a monopoly on craftsmanship. There are, educators tell us, individual differences between persons, including mechanics of course. However, superior ability springs from desire, mental attitude and willingness to work and learn, as much as—if not more than—from natural ability. Superior craftsmanship can be learned; and it is the main "trait" distinguishing top service specialists, shop administrators, executives and owners, from mechanics who plod along doing routine work in mediocre fashion.

For the shop man with the interest in developing his skills, and thereby his future, the path to better craftsmanship is clearly marked. It is equally apparent to the shop owner or administrator who makes the health and growth of his business his first concern. Training, for example, even inspiration, are within easy range of practically any shop. To understand more fully how an individual can do automotive service work that best serves the interests of all persons concerned with any job, let's review the requirements of superior craftsmanship.

UNDERSTANDING SPECS AND INSTRUCTIONS

One basic requirement is the ability to comprehend the technical written materials that must be used in servicing a modern car properly. The importance of the specifications and detailed instructions is recognized by the car manufacturers, as evidenced by the factory service manuals they issue for each model.

These manuals are carefully written, profusely illustrated; and contain all the information needed for disassembly and re-assembly, adjustment, repair and replacement, and trouble-shooting. Every part and system in the car is covered by precise instructions on correct methods and procedures for every type of necessary service operation. Tolerances allowable throughout the vehicle are clearly set forth—based on long engineering and years of experience.

Real craftsmen follow the instructions given, keep well within the allowable limits where tolerances are involved. Any instructions that are not clear or readily understood,

(*Continued on page* 38)

A real craftsman will be neat and orderly in his work. Here is a good example. The small parts of a four barrel carburetor were laid out in precise order on a clean cloth; and notice the arrangement of tools.

Now... Carter makes carburetor clean-out jobs easier, more dependable... more profitable than ever for you

WITH THE NEW CARTER *Zip-Kit*®

GENUINE ORIGINAL EQUIPMENT PARTS

for the most popular Carter carburetors...

AT A SENSATIONALLY LOW PRICE!

NEW PROTECTIVE PACKAGE...

Each Zip-Kit is enclosed in air-tight, moisture-proof, heat-sealed metallic foil. No more "mysterious disappearance" of parts.

Now you can be sure of doing precision carburetor clean-out jobs—by specifying and installing *precision* carburetor parts—made by the same manufacturer whose carburetors are on 24 million cars today!

With Carter's Zip-Kit you'll always be ready for fast, *dependable* clean-out jobs—and at a tremendous per-kit saving! In fact, the new Zip-Kits are priced so that you'll never again want to consider using other than genuine, original equipment parts!

Make more profit two ways! *Sell the need* for a carburetor clean-out job with every tune-up . . . then back up your skills and labor with the best of precision-made parts . . . in the new *low-priced* Carter Zip-Kit. Call your supplier now!

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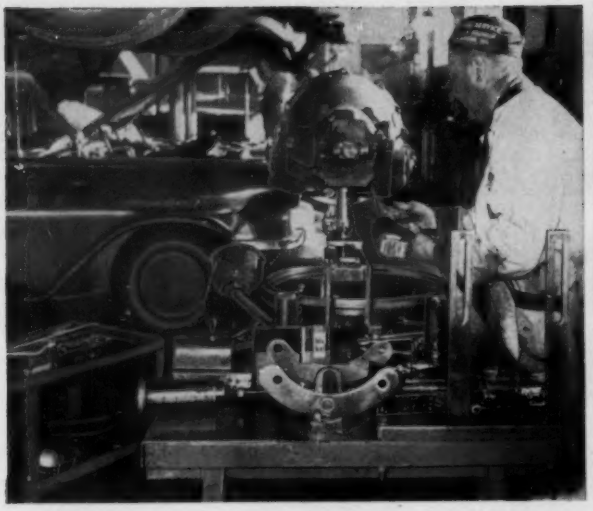


Working on automatic transmissions means doing the work strictly "according to the book" and involves handling a lot of precision parts. The work does not have to be messy, and can be done in an orderly fashion, as being done here.

A good example of how not to do automatic transmission work. The bench is messy and there is no order in the way the parts are scattered around. The mechanic is a capable man, but "craftsmanship" could have made his work more efficient.

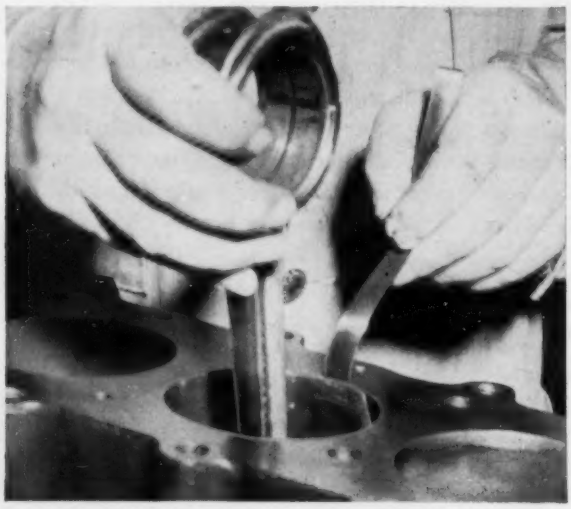
are mastered by study or inquiry. The background training and experience of the craftsmen make the instructions and technical information understandable and applicable.

KEEPING "KNOW-HOW" CURRENT

It is essential to have up-to-date knowledge of the correct basic principles and procedures, as well as specific knowledge of changes and new items. Each year brings in many model changes; often new devices or models. In addition, there are frequent changes during the year which must be known to the men in the shop.

Considering the new automobile equipment introduced since the general adoption of automatic transmissions, gives an indication of the body of knowledge that the craftsman masters. All this equipment must be serviced. Power steering, power brakes, automatic seats, electric window regulators, automatic head-light dimmers, complex heating systems, air suspension, etc., each has its own detailed technical literature and established recommended procedures.

Checking piston fit in cylinders, as this man is doing with a feeler gauge, takes real "know-how;" one of the attributes of a craftsman.



The alert craftsman also keeps informed about all tools and shop equipment available. Automatic transmissions, carburetors, rear axles, etc., require special tools and gauges for certain servicing operations. Those required by the shop must be available; and their use must be understood. With the increasing popularity of foreign cars, shops where these cars are serviced, should have sets of metric wrenches and sockets for those of other than English manufacture (which use inch sizes).

TROUBLE-SHOOTING SKILL

Another phase in automotive craftsmanship is understanding of the actions and interactions of powerplant and system components. As an automobile is operated, there is wear and gradual deterioration of certain parts. The mechanic must frequently inspect components in the course of his work, and make decisions as to what should be done in connection with the repair work. Ability to analyze the condition of parts and systems accurately, to determine what replacements and labor are necessary, is important, from two angles:

Correct analysis will speed up the work, resulting in a good job, and avoid unnecessary disassembly and replacements. "Holding the job down" is good customer relations; while the motorist usually is willing to pay for what is necessary, he seldom wants to "rebuild" the entire car to solve a current problem.

For example, on a "hard-starting" complaint, craftsmen know what tests and inspections are necessary on the ignition system, the generating system including the battery, on the starting system, fuel system, and the engine itself, to "pin down" the reason for hard starting Once the cause of trouble is known, correction is generally a simple matter.

In the case of an engine job, it is necessary to know what to look for as evidenced by the condition of the pistons (ring groove wear); condition of piston pin bearings; collapsed piston skirts; scored piston thrust surfaces and bad rod alignment. The "book" must be followed exactly in putting in rings, fitting new pins; in checking rod alignment on reassembly of piston, pin and rod. Cylinder walls will be accurately checked to determine

wear and taper; and whether re-ringing, only; knurlizing and new rings, or reboring and installing new pistons and rings, will be required for a satisfactory job.

On the valve system, the craftsman checks valve seats after grinding, using a dial indicator to be sure they are concentric with the valve stem guide; meticulously cleans the guides, checks the condition of the hydraulic valve lifters, if used on the model.

Crankpins will be accurately "miked" to check for out-of-round and possible taper. Bearing wear will be checked, and any failure analyzed to prevent repetition of the trouble.

On automatic transmission work, meticulous cleanliness will be observed; and the manufacturer's instructions carefully followed. Equipment for making all the necessary pressure tests, and the specified settings and adjustments, will be at hand . . . and used!

Skill and dexterity in the use of tools is a "must" of course. This particular skill includes not only the manipulation, but the selection and adaptation of tools as well. Typical know-how covers, for example, the steps to remove a broken stud or screw, or parts that "don't want to come out." Usages of special purpose tools and time-savers like the impact wrench, must be understood, and the required tools kept on hand.

The men doing precision engine work are among the finest craftsmen in automotive service work. When reboring cylinders, the dimensions are measured in tenths of a thousandth, which requires craftsmanship.

Without proper tools and procedures for tubing fittings, as one example, trouble and lost time usually result. For instance, it is easy to round corners or distort S.A.E. inverted fittings or the compression type, both widely used. Threads on the soft brass fittings are easily crossed. The craftsman has the sensitive "feel" that tells him when the threads are properly engaged. He knows how necessary it is to align male and female threads in exactly. He will use a tubing-fitting wrench that applies force to five corners of the hex on tight nuts, and thus avoid slipping or distortion.

The simple screw driver that might seem safe in the hands of the inexperienced, can be quite destructive if not properly used, and if not in good condition. Craftsmen know that when removing tight slotted screws, a firm pressure on the driver to keep it from slipping out of the slot, plus a strong, steady twist, generally loosens stubborn screws. He also knows that the screw driver blade must be square and sharp. The wide use of Philips screws with the cross-shaped slots makes it easier to remove tight screws without damaging them; but many slotted screws are still in use and have to be removed from time to time.

When it comes to regrinding crankshafts, it takes a craftsman. Both size and finish must be just right, with no room for errors. Here the mechanic is checking the crankpin diameter for a preliminary measurement before using the machine's pre-set dial indicator for the final size.

The above and many similar applications of skill and knowledge are routine to automotive craftsmen . . . but only to craftsmen!

EASY TO "SPOT"

Good work habits also identify the craftsman. He is clean and orderly in his work. He figures out the proper sequence of operations in advance, and follows this sequence. He keeps within easy reach, containers for small parts, such as screws, nuts, washers, springs, clamps; and sees that every one goes into the right container as soon as it is removed. Craftsmen know how quickly and easily small parts get misplaced or lost. It is much easier and less time-consuming to prevent the loss than to search for missing parts.

If the part or unit being worked on is dirty, as is so often the case, it is cleaned up by the best means available before worked on.

The work bench is kept clean, and parts that are

(*Continued on page 74*)

The craftsman doing engine work will always check for correct rod alignment before installing piston and rod assemblies.

ANOTHER **BLUE STREAK** SECRET SERVICE TIP FOR YOU.

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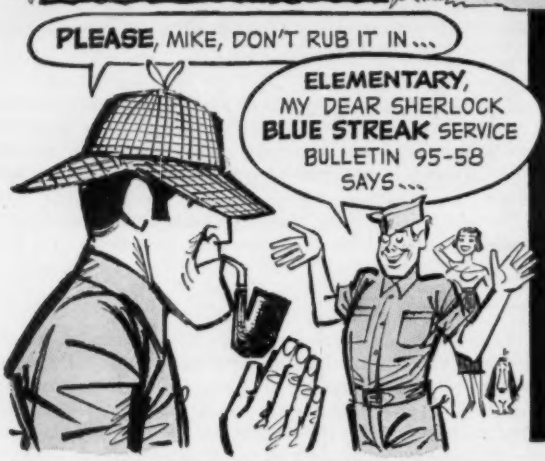
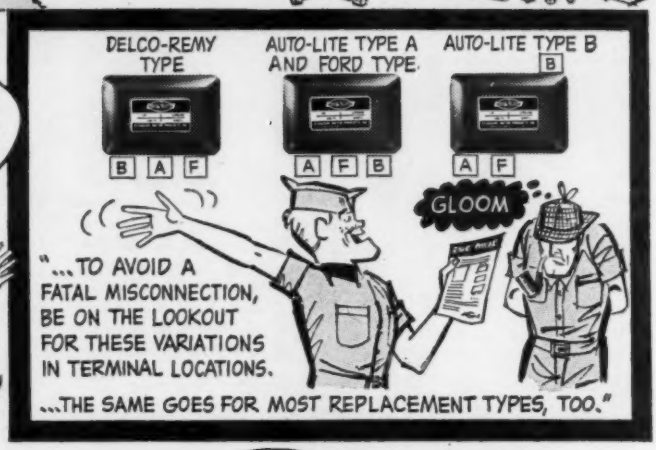
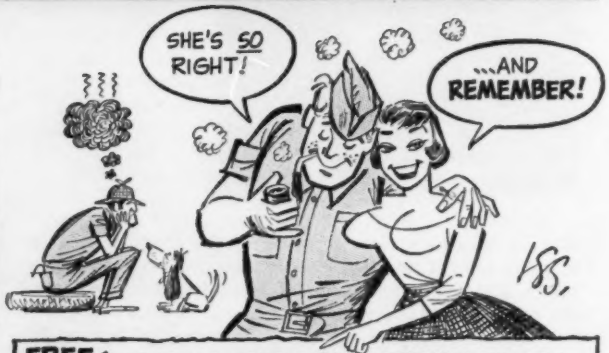



DELCO-REMY TYPE
B A F
AUTO-LITE TYPE A AND FORD TYPE
A F B
AUTO-LITE TYPE B
B
A F
GLOOM
"...TO AVOID A FATAL MISCONNECTION, BE ON THE LOOKOUT FOR THESE VARIATIONS IN TERMINAL LOCATIONS.
...THE SAME GOES FOR MOST REPLACEMENT TYPES, TOO."



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Servicing the Volkswagen

General knowledge of the design, observance of necessary clearances, tolerances and torquing specifications opens the door for custom or general maintenance applicable to this small import motor car.

Part VI of a feature series

By E. S. HARRIS
Field Editor

● SOME MECHANICS comment that the Volkswagen, little workhorse that has become a universal transportation unit the world over, is a latter-day successor to the Model T Ford. Its owners claim the same superlative economy and performance, and express the same confidence in its abilities.

Similarly, manufacturers of all types of accessories hurry to supply everything from a gas gauge to a sports body, for like the Model T the little VW is originally assembled on the theme of utility, not gadgetry. There's plenty of room for any additional accessories desired.

Due to their swelling numbers and the opportunities for the installation and servicing of all types of accessory units, as well as for conventional servicing of all kinds, the little cars have become a good source of revenue for the shops that can handle them. Owners are apt to spend thousands of service dollars in the shops of their choice in the near future.

While the configuration of the VW's may differ, the service procedures required vary hardly at all. A sporty Karmann Ghia body, or a convertible or other special body may grace the little "bug," but the chassis and engine are usually unchanged.

Since accessories are so commonplace on the VW's that roll into the shop for service, this discussion will cover some of the more familiar ones, in addition to giving a rundown of standard servicing operations for the car itself.

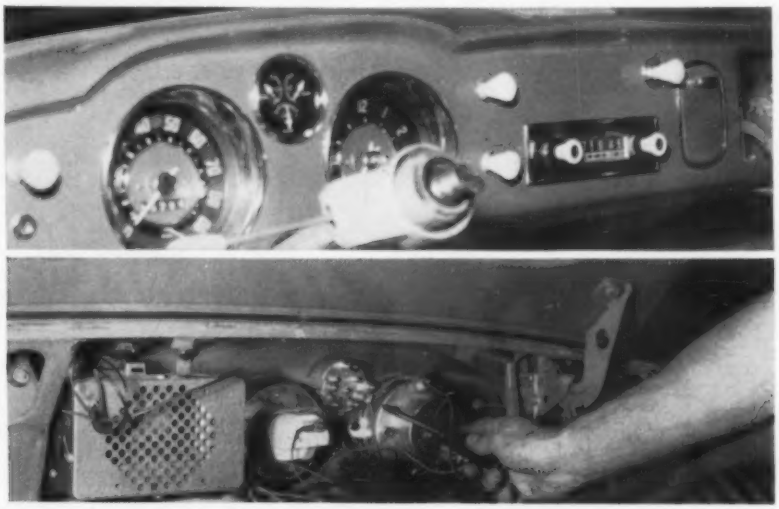
ENGINE AND TUNE-UP SPECS

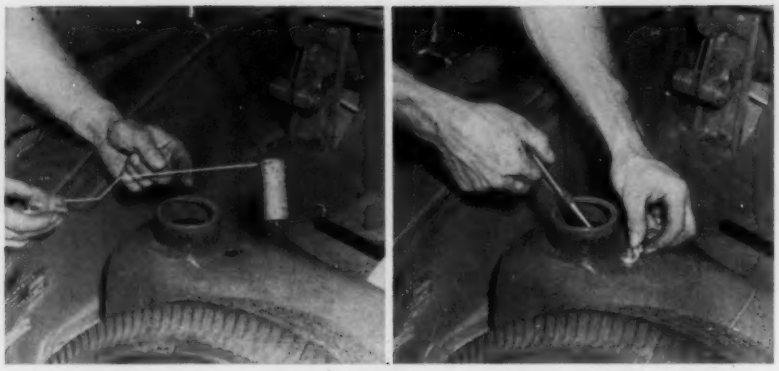
To begin with, the Volkswagen is powered by an air-cooled, OHV, four-cylinder, horizontally opposed, 36 hp (at 3,700 rpm) engine. It develops 56 lb.-ft. torque at 2,000 rpm; has a bore and stroke of 3.03x2.52 in., respectively, a displacement of 72.7 cu.in., with a compression ratio of 6.6:1. The car weight per hp is 51.1 lb., and of course, the engine is in the rear. Fuel capacity is 10.5 gal. with a 1.3 gal. reserve which is turned on in the front-center of the firewall. Basic tune-up data is as follows:

Valve clearance (adjusted cold): .004 in.
Firing order: 1-4-3-2
Battery: 6 volt
Generator: 160 Watt at 2500 rpm (voltage regulation)
Distributor: Centrifugal and vacuum advance
Spark timing: 7.5° before TDC
Breaker point gap: .016 in.
Spark Plugs: 14mm, gap .024 in.-.028 in.
Engine Oil Sump.: 5.3 pints

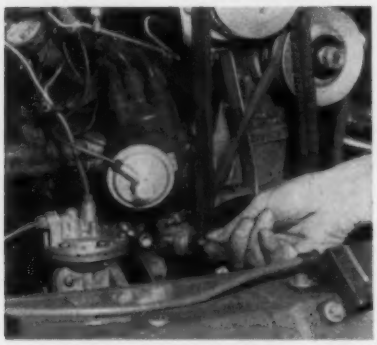
The engine is bolted to the rubber-mounted transmission case with four

Combination fuel, ammeter and oil temperature gauge is installed in instrument panel, between speedometer and clock, after drilling hole with 2⅛-in. hole saw.

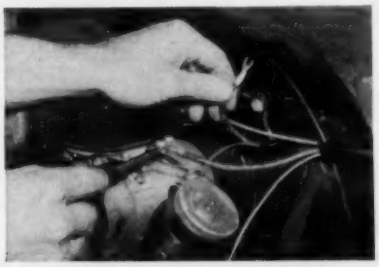




Accessory tank unit is installed through the filler hole after drilling hole to receive unit collar and electrical terminal.



Accessory oil temperature gauge sending unit is installed ahead of the standard oil pressure lamp sending unit in the oil line.



New lead cable to accessory ammeter replaces original battery lead.

bolts. Its two-piece, alloy crankcase is bolted together at machined mating surfaces, so that replacement must be made in pairs. The cast cylinder barrels are finned and are interchangeable. One cylinder head serves each pair of cylinders. No cylinder head gasket is used; copper-asbestos rings seal the head cylinder joints. Valve seats are shrunk into the head; and threaded steel inserts receive the spark plugs. Overhead valves are operated by a pushrod and rockerarm arrangement. The four-lobe camshaft is gear driven, its gear being either fiber or metal, depending on series; and it is carried in three bearings integral with the crankcase.

The crankshaft is a forging with hardened journal surfaces carried in four bearing shells; end thrust is taken by the bearing next to the flywheel. The connecting rods have lead-bronze bearings and bronze wristpin bushings, the pins are full-floating.

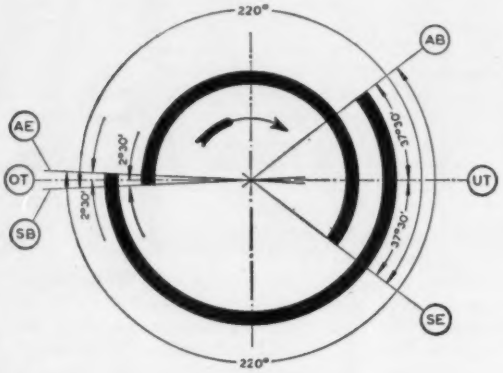
The engine is removed from below after the rear of the car is raised. After controls, cables, lines, and other parts are disconnected, two nuts are removed from the lower and upper engine mounting bolts; attaching parts are loosened, engine jack is positioned under engine and the bolts are removed. Engine is moved back until transmission main drive shaft is cleared. Then the engine can be lowered on the jack and tilted for clearance and removal from chassis. To replace the engine, this procedure is reversed. When removing or replacing engine, it's suggested that rear cover plate be removed. If clutch isn't properly centered to receive shaft, a centering tool is required to align it.

Damaged or burnt valve seat inserts may be reconditioned with a 45-deg. seat cutter so long as the specified width of the seat face is maintained and the outer edge of the 15 deg. chamfer does not exceed the outer diameter of the valve seat insert. Seat width of intake valves is .051-.063 in.; exhaust valves, .067-.079 in. The valve timing diagram shown applies to a valve clearance of .004 in. with the engine cold. After checking the valve timing, the normal valve clearance of .004 in. should be restored.

Valves having pitted stem faces can be made serviceable by placing a cap over their stem ends. This cap is placed in position before installing the rocker arm. It does not call for any additional securing.

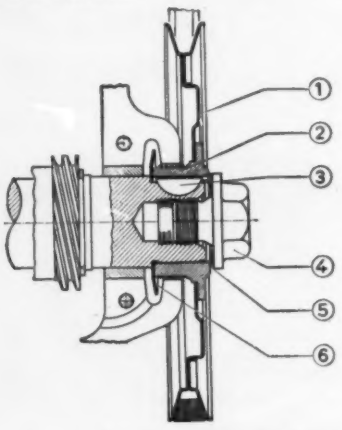
COOLING SYSTEM

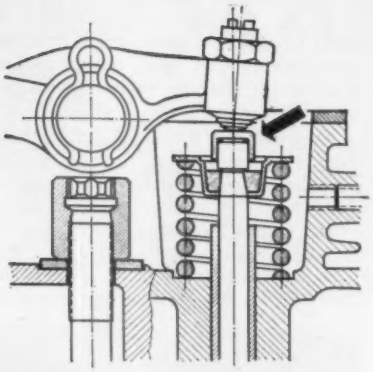
The cooling system deals with the circulation of air instead of water. Proper control and precaution against leakage is as important as it is in liquid coolant systems. The blower impeller is attached to the inner end of the generator shaft and is driven by the fanbelt working on the pulley at the outer end of that shaft. The fan housing is removed as a unit with the generator after the attaching screws throttle ring spring, etc. are removed.



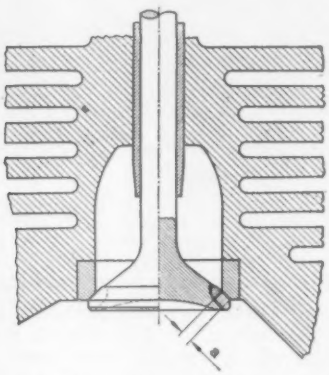
Volkswagen valve timing diagram. Intake opens (SB) 2°30′ before TDC; intake closes (SE) 37°30′ after BDC; exhaust opens (AB) 37°30′ before BDC; exhaust closes 2°30′ after TDC.

Sectional view of crankshaft pulley. 1, pulley; 2, oil return thread; 3, key; 4, mounting bolt; 5, spring washer; 6, crankshaft oil thrower.





Arrow shows cap which can be placed over pitted valve stem ends before rocker arm is installed.



Seat width (A) of intake valves is .051-.063 in.; exhaust valves .067-.079 in.

Control of the cooling air flow is accomplished by a thermostatically regulated air "throttle ring" located at the back of the fan housing. Its normal position is tipped slightly outward at the top; and it is centered by moving mounting bolts in their clearance holes. When the engine is cold, the regulator ring should rest against the air intake flange, slightly loaded. As engine is warmed the thermostat element moves upward to the end of its travel. In this position the distance from the center of the induction flange to edge of regulator ring should be .79 in. (20mm)

THERMOSTAT CONTROL

To adjust thermostat control with engine in the car, disconnect the regulator ring operating lever. Warm up engine until thermostat reaches upper stop. Adjust ring to 0.79 in. as mentioned. Tighten actuating lever. (A bench adjustment is made by simply moving the thermostat upward to its stop by hand). Check linkage for free operation.

The fan belt is adjusted by changing its depth in the flange of the generator pulley.

Should it be necessary to re-install the crankshaft fan pulley, the latter must be inspected for possible damage. Clean the oil return thread. Make certain the pulley runs true. In case of oil leaks use an oversize pulley with bigger oil return threads.

Proper belt adjustment is a 1-inch deflection with a thumb push halfway between pulleys. Tension is adjusted by taking the pulley apart. First, anchor the pulley (placing a screwdriver in slot in back); then, unscrew pulley nut from shaft so outer half is removed. Spacer shims between the pulley halves are removed to tighten belt; added to loosen it. Recheck tension after a few miles to make sure it remains the same, because the proper belt tension is vital to the engine cooling system.

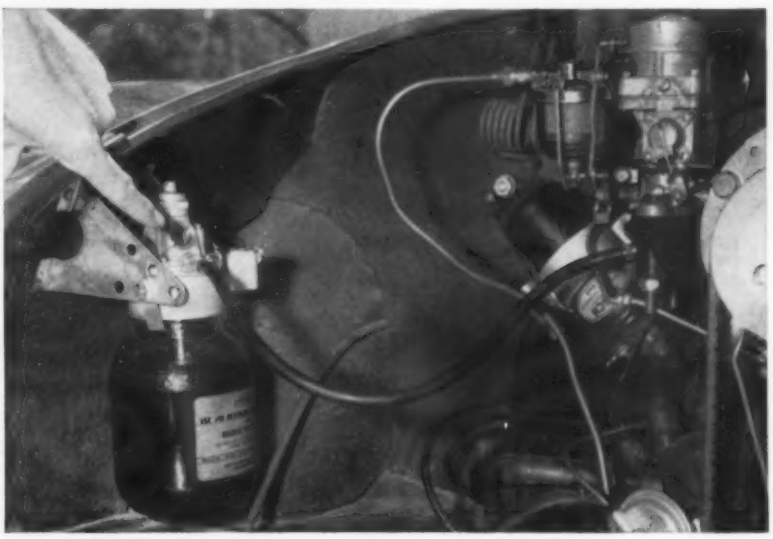
LUBRICATION SYSTEM

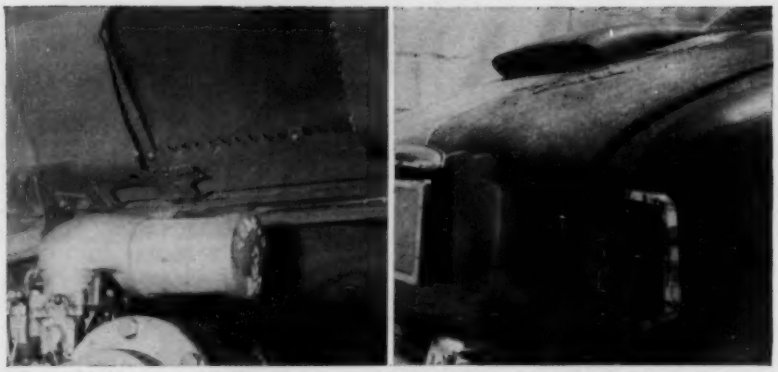
An oil strainer is housed in the bottom of the oil pan. It can be removed for inspection or cleaning by removing nuts and washers and the round cover plate. Some engines may have a magnetic filter in this housing.

The oil pressure relief valve is also reached from the bottom side of the engine. It is under a screw plug and is spring-loaded. Oil from the pump is fed through an oil cooler at the upper side of engine, inside the fan

This belt-driven supercharger was installed as an accessory just above the generator and between the carburetor and the manifold.

Special oiler required to lubricate the supercharger acts as an upper lubricator in the engine.





On the Karmann Ghia body, the supercharger raises the carburetor and air cleaner to a level where the deck lid must be cut away to clear them. Metal hood supplied with the "blower kit," is bolted to the deck to cover the clearance hole necessitated by the air cleaner.

housing, then to the various parts of the engine. Oil flows back into the pan against the pressure of the oil pressure relief valve. The free length of the valve spring is 2.04 to 2.08 in. A stuck plunger can be removed by screwing an "easyout" or tap into it.

The oil cooler, which can be removed after the fan housing is off, is retained by three nuts. Leakage of the cooler may indicate that oil pressure is too high. Core should be checked for leaks with a pressure of 85 lbs. p.s.i. Use new gaskets when re-installing.

The oil gear-type pump is located in the lower front area of the engine, and is driven by the camshaft. It is reached after engine is removed. The rear cover plate, fan pulley and pulley cover are first removed; after which the oil pump cover nuts can be reached and the cover and gasket is removed. The gears can now be lifted out. A special puller is recommended for pulling the pump housing (VW 201).

INSPECT FOR WEAR

Pump housing and gears are inspected for wear, specified backlash between gears being .0015 in. to .003 in. Gear sideplay is measured with cover removed and is .0025 in. to .0075 in. with a maximum allowance of .008 in. The idler gear pin should be tight in the housing. Peen if necessary. Clearance between gear ends and housing should be .004 in. without gasket. It is measured by placing a steel scale across housing and gears and sliding a feeler gauge between scale and gears.

If the cover is worn, it should be ground smooth or replaced with a new one. The new gasket should be .0031 in. thick. No sealing compound is recommended. The pump mating surface on the crankcase should be clean and even.

As previously mentioned, the crankcase is a two-piece assembly. It must be split before service to camshaft or crankshaft is undertaken. Sealing compound is used without a gasket to prevent leakage. Consequently, a soft hammer may be used to separate the halves. Never pry them apart with a bar inserted between the surfaces.

Fan belt adjustment is accomplished by adding or removing shims between the halves of the fan pulley.

Practically all mechanics who have serviced the VW are pleased at the accessibility and the ease of performing most operations, as well as adding accessories. Many old timers claim that, as with the old Model T Ford, any shop that cares to "give it a try" can handle repairs, routine maintenance and even special jobs.

Atomic testing strengthens case for shorter oil-change interval

• ENGINE WEAR during winter driving in city traffic increases roughly in direct proportion to the interval between oil changes. Motorists pay a double penalty for "stretching out" the interval. Oil change intervals recommended by the American Petroleum Institute are both reasonable and desirable.

These are the conclusions of the Gulf Oil Research Center after completing a program utilizing radioactive test techniques. Irradiated piston rings were used in both lab test engines and a number of cars driven in city traffic under cold weather conditions. More than 190 oil samples were tested for the degree of radioactivity resulting from particles of the "atom-tagged" piston ring metal.

Rings and other engine parts were found to wear twice as fast when oil was changed every 1,000 miles, as when changed every 500 miles. When the oil was changed every 2,500 miles, wear was four times as fast as that occurring on a 500-mile-change practice.

GOOD CARE BONUS

One notable discovery was that the motorist who changes his oil more frequently profits in two ways. In the first place, of course, he reduces engine wear; in the second, he saves a little on the lubricant bill. It was found that after 30,000 miles, cars following a 1,000-mile change regime were averaging 40 per cent better oil mileage than those in which the oil was changed every 2,500 miles.

Of the cars field tested by driving in winter city traffic, half had oil changed every 1,000 miles; the remainder, every 2,500. After 30,000 miles, rings in those on the 1,000-mile change had lost four per cent of their original weight. Their opposite numbers lost nine and two-tenths per cent—more than twice as much—on the longer oil-change interval.

American Petroleum Institute recommendations call for a change of crankcase lubricant every 500 miles during city wintertime driving. For local driving and regional trips in mild to warm weather, 1,000 miles is the recommended interval. It's every 2,000 miles for open highway motoring under normal summertime weather or comparable conditions. On this basis of its latest studies, Gulf Research Center concludes these intervals to be reasonable and desirable.

Motorists should be advised, the Center points out, that the longer oil change intervals currently advocated for some new-model cars apply only when they are operated under the most favorable conditions. It explains the more severe wear of winter city driving as the result of the engine generally operating at temperatures too low to dissipate acidic combustion products. These accumulate in crankcase oil and attack metal surfaces.

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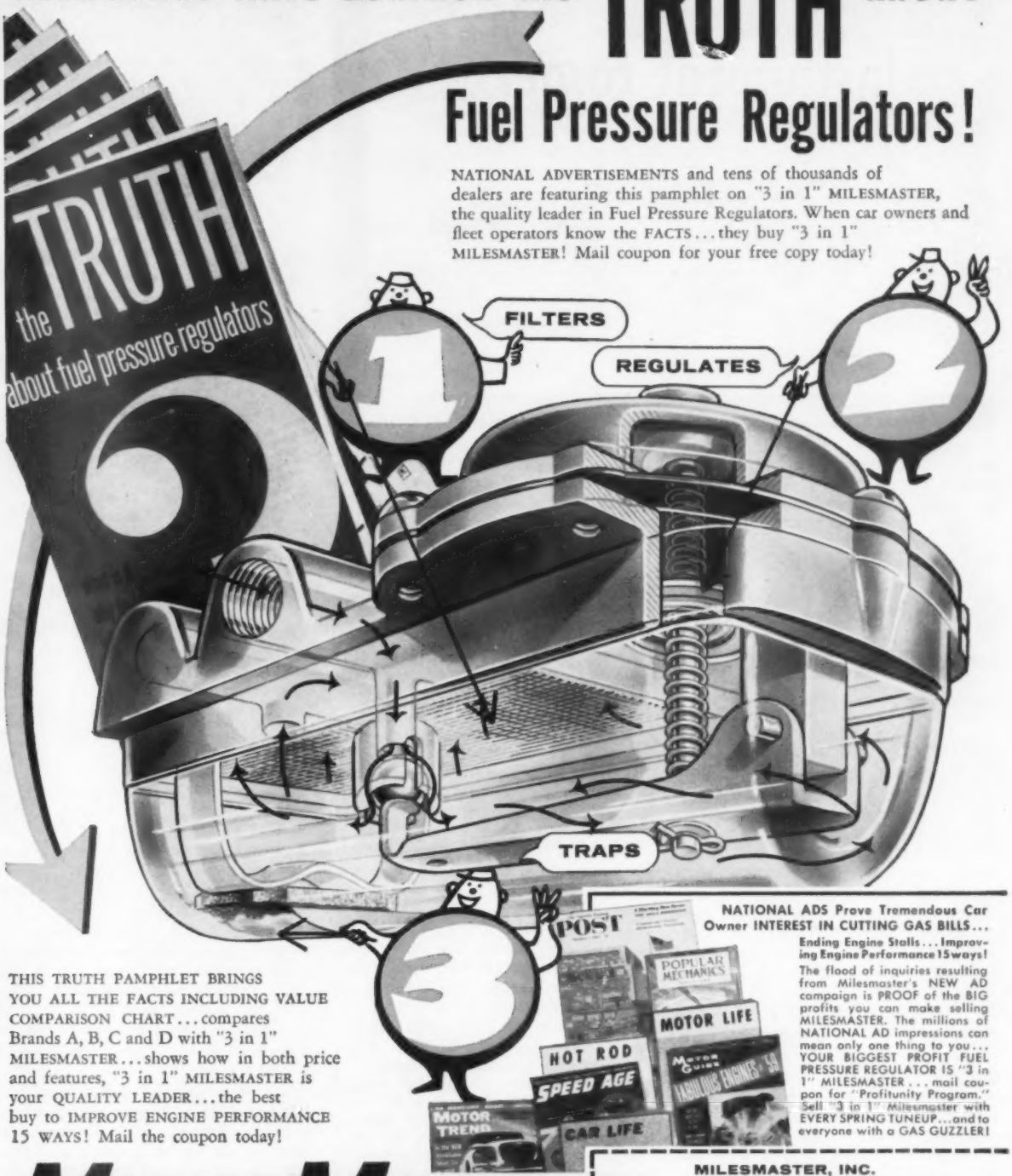

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Instrument corner

Conducted by The Instrument Man in the interests of simpler, faster, more satisfactory—and more profitable—service operations.

• BANG... gunfire, not backfire, assailed the Instrument Man's ears as he watched his favorite TV Western in the peace of his living room. But just as the "good guy" gunned down the "trouble shooter," the jangling of the telephone interrupted.

"Pardon me," a strange voice said in typical "I gotta problem" tones, "for bothering you at home. But a friend of yours suggested you might help me out. My Plymouth Six hasn't been running right lately, so I took it to a shop near my home for a tune-up. Paid them $18 for the job, and for putting in anti-freeze.

"But the car runs as bad now as it did before. Our mutual friend thought you'd know a place I could take it to have it really fixed."

After asking the caller where he lived, Jim thought a moment, then suggested the shop of one of his "boys" who would be careful and thorough. The stranger thanked him and hung up.

Being in the neighborhood of the shop he'd recommended a week later, the Instrument Man dropped in to see how things had turned out.

A CASE OF NEGLECT

"You know, Jim," the shop operator told him, "that guy you sent to me was really 'taken' when he paid for what was supposed to be a tune-up. We started the engine and put a timing light on it to see how close the timing was. When we gunned the engine we saw that the advance didn't look right. When we pulled the distributor we found there was no vacuum advance because the vacuum advance diaphragm was ruptured; so we replaced that. Next we checked the dwell, and found it was excessive, 'way out of spec's', so we set it right. Apparently it wasn't even checked before; and of course that threw the timing off, too.

"We pulled the plugs, and even though they were new, they had not been gapped properly. We corrected that. While we had the plugs out, we thought it might be a good idea to check the compression, which we did. To our surprise we found that the compression was within limits, which told us that the valves and rings were satisfactory.

"We tested the battery and got a gravity of only about 1.235; so we recharged it. When I was in the car, running the engine after we got right specs set up on the different units, I stepped on the brake pedal and it went almost to the floor board. All the brake instructions say that the brake pedal should never be allowed to go lower than 2 in. above the floor board. We pulled a front wheel, and found that the lining was worn down to the rivet heads. The drum was beginning to score. The other front wheel was the same way.

"I got hold of the owner on the phone and told him what we had done, and that he also needed a brake job. Our work, including the brake job, plus a few new parts, amounted to a little more than $50.00. When we gave him the bad news, he was more interested in getting his car fixed than in the cost, and told us to go ahead with the work.

"Two days later he came in to get the car and paid the bill. He drove out, but came in again about an hour later. Believe it or not, all he wanted was to tell us how nice the car ran and how much he appreciated our fixing it. He added that he'd bring in all his future work and send his friends in, too."

WHY INSTRUMENT CORNER?

Because we know the help he's given so many shops first-hand is just as valuable in the re-telling as it was in the happening, we've asked The Instrument Man to pass along some of his more interesting experiences. As an old-timer in automotive servicing who is distinguished by the fact that he's kept up-to-the-minute on developments in his field, The Instrument Man gets many calls for help from friends, acquaintances and even strangers, in shops large and small. He generally solves the cases, because of his understanding and appreciation of trouble-shooting instruments.

ANOTHER CASE OF CARELESSNESS

While the Instrument Man was still in the same shop, the operator said to him, "Jim, we've had a couple of other cases lately that you might be interested in. You're always talking about doing what is needed and doing the job right.

"A fellow came in a week or so ago, with a 1958 Chevrolet. His complaint was that it was very hard to start when cold and when finally started, didn't seem to have any power. His garage entrance is on an incline, so that he had to back up a hill to get out of the garage. The car barely had enough power to make it, and the engine would stop three or four times while trying. After running long enough to get warmed up, the owner said it ran good except that gas mileage was poor.

"He'd taken it back to the shop where he spent $58.00 on tune-ups and service recently; but was told that everything checked out all right and nothing more could be done. Noticing our sign, 'Scientific Engine Testing and Tune-up,' he came in to see if we could do anything for him.

"I made a few quick checks to see how near to specifications things were. Ignition timing was good; dwell was what it should be. Gunning the engine with the timing light on it showed that the advance was about right. So it looked off-hand, as if the tune-up wasn't too bad.

"Thinking over what the owner had told me about hard starting when cold and not having much power until warmed up, I got a bright idea. I took off the air cleaner to look at the choke valve, and guess what! The valve plate was stuck solid about one half open! Well, I took some solvent and a screw driver and between soaking and scraping, I got the choke plate freed up. The rest of the choke system seemed to be in working order.

"We let the engine stand until it had cooled off, and saw that the choke

closed as it should. We turned on the ignition and the engine started right up. The choke action was perfectly normal, and that stuck choke was all that was wrong with the engine.

"We charged only for the time we put in, and the owner was sure happy when he picked up his car! It was easy to figure out what happened at the other shop. Each time when he drove in, the engine was well warmed up, and everything was apparently OK. They didn't pay much attention to his story of cold hard starting—didn't even glance at the inside of the carburetor.

"That one was certainly a lesson on the value of being thorough, the way you always 'preach'!"

FAILURE TO TEST

"We had another one along the same lines. A 1955 Ford V-8 came in. The owner said he had just had the car tuned up, and it still didn't perform the way it should. Gas mileage was 'lousy,' he said. In some recent mountain driving, the engine kept heating up. He had to stop every few miles on long up grades to let it cool off.

"As we had done on the Chevrolet, we made some preliminary checks and found the dwell, timing, point condition, and so on, all pretty good. Nothing was said about compression, but I like to play with our new cylinder leakage tester, so I got it out, pulled the plugs, and tested each cylinder.

"Five of the intake valves were really bad, with leakage of over 35%; the best cylinder showed 20%. That explained the poor performance. We did a valve job, which should have been done by the shop that did his tune-up. After our job the car ran nicely."

"Now here's a question for you," said the Instrument Man. "In general I have a lot of respect for your ability and thoroughness. But tell me, why did the engine heat up on long grades, if the only trouble was leaking valves, and the cooling system was in good condition?"

"To be honest with you, Jim," the shop man answered, "I didn't give that much thought."

"Well, rather than have you strain your brains, I'll tell you," Jim said. "You see, with a lot of the fuel-air mixture that goes into the cylinders, leaking past the defective valves, more fuel and air have to be supplied. In other words, the throttle must be opened wider. This means more heat produced in the engine, and the cooling system just doesn't take care of it at the given speed and load conditions."

Thanking the shop man for his good handling of the job that had interrupted his evening's TV, the Instrument Man went on his way. While driving to his next call, he reviewed the sad stories he'd just heard about poor diagnosis and incomplete work. If other service shops would learn from such cases, shops would do more work, for happier customers. Careful and complete testing alone would go a long way toward bringing business to that point, the Instrument Man reflected.

Frozen Door Locks?

If called upon to thaw out frozen door locks, here are two helpful suggestions:

1. Select a length of hose of the correct diameter to slip over the outside of your service truck's tail pipe. With the truck engine running, connect one end of the hose to the tail pipe and apply the other end to the frozen door lock. The lock will quickly thaw out. Keep the hose handy in your service truck for such emergencies.

2. Heat the lock key with a match or cigarette lighter. Insert the key into the lock as far as it will go. Repeat this process as often as necessary . . . but use care not to bend or twist the key.

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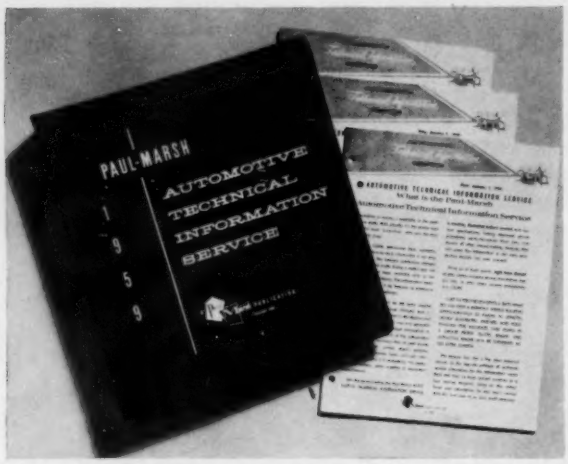
EIS AUTOMOTIVE CORP., Middletown, Conn.

New Monthly Service Bulletins To Keep Mechanics Up-To-Date

The Paul-Marsh Co. announces the release of their new Automotive Technical Information Service—a monthly technical bulletin containing authentic technical information, new specifications, new diagnosis procedures, service corrections or changes, service short cuts and time-saving methods for all cars as released by car manufacturers. It will also contain information on new equipment releases and new or special tool requirements needed to properly service modern motor cars.



A foreign car section is included to answer the trade needs for basic information on specifications, tune-up procedures, and minor service information for this growing market.

The Service is tailored to answer the need of independent repair shops, specialized service shops, and super service stations for authentic up-to-date information on specification changes, production changes, and technical information on carburetion, ignition, brakes, automatic transmissions and other specialized units.

All articles will be written in easy-to-understand mechanic's terms, and fully illustrated with step-by-step pictures of how to do it.

For complete information on this new service, circle No. 99 on the Reader Service Card.

Starting "Ping" and "After-Run"

Have you ever noticed that some late model, high compression cars will occasionally ping or knock when starting? According to the service engineers of Champion Spark Plug Co. this is nothing to worry about, and is not detrimental to engine life. It is characteristic of most high compression engines, according to Champion, and apparently is a sort of dieseling effect—as the pistons move upwards on their compression stroke during relatively low cranking speeds, there is enough heat of compression to ignite the fuel prematurely in the cylinders. This causes a sharp rap which is sometimes misdiagnosed as "spark knock." The ping normally disappears after starting, as pistons are moving at a higher rate of speed and the fuel charges are ignited at the correct time.

The company warns, however, that if a loud ping or knock is heard during normal driving on acceleration, the consequences can be serious. Check ignition timing; if correct, you will probably find that the owner is using a gas of too low octane rating.

As for the phenomenon of after run—where engine continues to run for a short time after ignition is turned off, especially after a long, hard drive—this is usually a result of excessive fuel entering the intake manifold. It can generally be corrected by decreasing idle speed to correct specifications.

Loose Shock Can Damage Brake Tubing on Dodge Trucks

A recent service bulletin from the Dodge Truck Division states that under severe operating conditions, with an overload, it is possible for the rear shock absorber bracket attaching bolts and nuts on their Model D-100 trucks to become loose, to cause severe damage to the rear brake tube attached at that point.

Upon inspection, if it is evident that flexing has damaged or weakened the brake tube, it should be replaced and the two bolts which attach the shock absorber upper bracket to the frame side rail upper flange, and the one bolt which secures the bracket reinforcement to the lower flange of the side rail, be securely tightened, after which it is advisable to double nut the three bolts.

Under extreme service conditions, breakage of the rear shock absorber upper mounting bracket may occur. This bracket can be strengthened to cope with unusual stresses by welding it to the reinforcement, along the upper edges where the reinforcement extends up above the frame side rail. To assure proper alignment of the parts involved, the welding should be done while the mounting bracket and reinforcement are attached to the frame side rail, and with the shock absorber upper mounting stud and spacer in position.

Plymouth Camshafts Color Coded

To properly identify camshafts used in the various 1959 V-8 Plymouth engines, a stripe of colored paint is applied to the distributor drive-gear end of the shaft between the distributor driver-gear and the number eight cylinder exhaust valve lobe.

Engine-camshaft combinations are identified as follows: No paint—standard engine with 2-bbl. carburetor, camshaft part number 1947061. White paint—Super-Pak, camshaft part number 1944712. Blue paint—Dodge engine, camshaft part number 1945535.

The painted area of the camshaft can easily be seen by removing the distributor. It may be necessary, however, to rotate the camshaft to locate the paint mark.

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Replacement body panels

Growing congestion in parking lot and on highway, gives today's motorist frequent body repair problems. Service specialists have developed all the answers, which alert shops use to the profit of everyone concerned.

by Ed Packer
Member S.A.E.

• PRETTY CARS CAN be pretty hard to "iron out." When a fancy fender has just lost an argument with a lamp post or another car, it may pose quite a problem as to whether the damage should be repaired or the panel—either all or part—replaced with readily available factory replacements.

As the sheet metal swings in and out on the newest models—not in the breeze, but in the body designers' creations—*there is a growing tendency toward panel replacement* rather than repair.

It takes sound judgment backed up with facts, to determine the method of repair that is best for the customer and for the shop. Many body shops are guided by manuals which not only serve as a guide for labor required by various jobs, but *picture* the panels available from car dealers for the various makes and models. Many jobbers carry panels and portions of panels which most often need replacement as a result of rusting out and rubbing against curbs.

An example is the outer door panel—so commonly rusted out along the lower edge. The same for the lower edges of fenders. In such places, the panels are an absolute necessity. In the normal run of "parking lot blues" the dents are usually bumped out if you can get behind them, or pulled out with a hook-type slide hammer and then finished off with body metal or plastic.

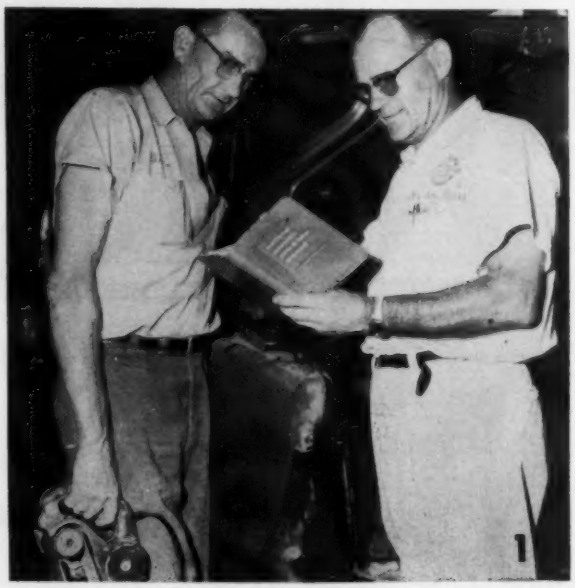
A TYPICAL REPLACEMENT JOB

Let's look at the way a typical panel replacement job is handled in a shop which for years has been doing the kind of body work that pleases customers. This is the body department of Slaton Chevrolet of Fort Lauderdale, Florida. The shop foreman is J. D. Lamon. These are the fellows shown in Fig. 1 where "J. D." is checking over a job with body mechanic Sylvester Wilkinson—"Slim" to his friends.

The panel replacement job just getting under way in Fig. 2 was made necessary by one of those glancing left rear collisions. Since there was to be a lot of welding in the rear area of the car, the *gasoline tank was immediately removed* as a safety precaution. All of the badly crumpled metal was cut away with a simple "T" shaped metal-cutting tool (which can be either hammer driven or air driven as in Fig. 3). Other tools for this type of work are nibblers and saws; and some mechanics do a great job with a cutting torch, in spite of the ever-present fire hazard.

No two collision jobs are exactly alike. But one fundamental is to cut away everything that is too badly damaged to use. Then the major openings of the body must be squared up. Figure 4, for example, shows "Slim" pulling the trunk opening into position. This particular collision ruined the trunk lid. So at the start of the job with only a little straightening of the opening, a new lid was installed. The right and forward edges were in pretty good shape; it took only a little bumping to align them with the new trunk lid. The bottom and left edges were something else again.

With the rear edge of the body roughed into shape, the rear body panel was clamped in place (Fig. 5). Then, as shown in Fig. 6, the trunk lid was brought down and the alignment of the rear body panel corrected where



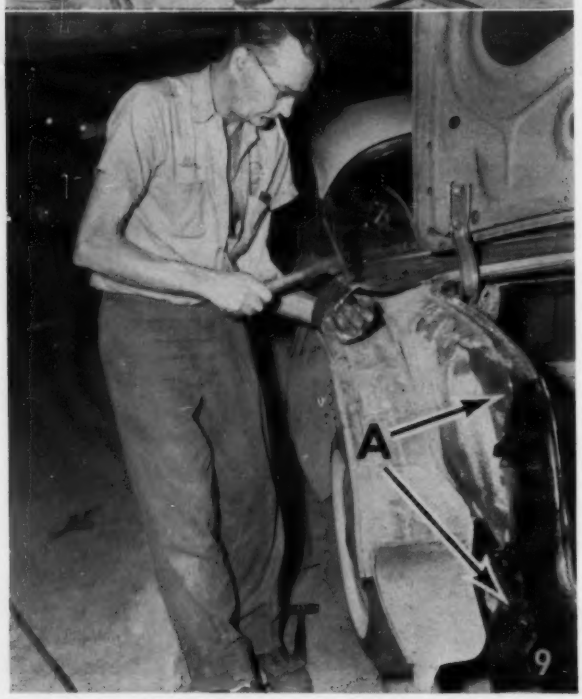
necessary, by shifting the clamps and panel—accomplished by much hand-slapping of the panel and lid.

The door of the car had not been damaged. So it was used to recheck body condition where the front end of the left rear quarter panel would come (Fig. 7).

Any bumping or welding, as in Fig. 8, had been taken care of on the various car parts to be sure that they would "stay put" when the panel finally went into place for checking and cutting to fit. With the left quarter extension panel (A in Fig. 9) fitted, all edges of the old body metal where the quarter panel was to go, were smoothed with a dolly and hammer, as is being done in Fig. 9.

Figure 10 shows the stock boy checking progress of the job with the parts used so far, namely the trunk lid

(1) Panel discussion. "Slim" Wilkinson, body man (left) and J. D. Lamon, body shop foreman for Slaton Chevrolet in Fort Lauderdale, Florida, check up on a body job. (2) Hammering some parts into rough alignment early step in panel replacement. (3) Air-powered body metal cutter. (4) Chains, clamps and hydraulic equipment for aligning trunk opening. (5) Preliminary rear body panel installation. (6) Checking panel alignment by lowering trunk lid.



(7) Using door to check alignment where front edge of left rear quarter panel will come. (8) Welding damaged inner parts in place. (9) Straightening edges where body metal was cut. (10) Checking new parts: A, trunk lid; B, rear body panel; C, left panel extension panel; D, left rear quarter panel.

(A), rear body panel (B), left quarter extension panel (C) and left rear quarter panel (D).

With a torch (Fig. 11) the shopman cuts off—without losing time and without precision measuring—the parts of the panel that were obviously in the way. Then, the panel was lifted into place and carefully marked for accurate cutting (Fig. 12).

In Fig. 12 a steel rule and scriber—actually an ice pick—is being used to mark the panel where it is to be cut. The steel rule has a hook on the end. By sliding it under the panel and hooking it onto the body metal where the panel is to fit, the exact location for cutting is located, then marked.

The spot shown in Fig. 12 where this precision mark is made, will be butted and welded, then finished with body metal. What appears to be lack of alignment and a big crack at the rear of the quarter panel being worked on, actually closes to a perfect butt joint when these parts are pressed together by hand. A clamp at the top of the left rear quarter panel and the left quarter extension panel will hold these in alignment during welding.

The door opening was handled in much the same way as the panel was marked in Fig. 12. Since the original car parts were in good condition at that point, and since the top of the old panel was OK for about 6 in., as originally observed in Fig. 2, the material at A in Fig. 13 was cut away with a torch. The body man is shown with his foot on the larger part of the panel, truing up the edges to the scribed line previously made on this new panel.

With the panel cut, the body man bends over the long edge of body metal at about right angles to its surface (Fig. 14) in order to add rigidity to this long and otherwise flexible area. Failing to do so would invite a wavy surface that would result in an uneven finished job.

The action seen in Fig. 14 is not as simple as it might appear. This stiffening up of an otherwise flexible edge could be overdone in places, thus making the surface uneven. But by repeated sighting and careful hammering

(11) Preliminary cutting to remove unneeded portions of new panel. (12) Precision marking for final cutting. (13) Final panel cutting: Part A, is cut away and discarded. (14) Bending edges of old metal approximately 90 deg. to add stiffness. (15) Disc sanding with No. 16 grit, in preparation for later tinning and application of body metal.

against the dolly block, the edge is kept true and given added stiffness. Then with a disc sander (Fig. 15) the paint along the edge is removed and the metal both roughened and brightened for future tinning and leading.

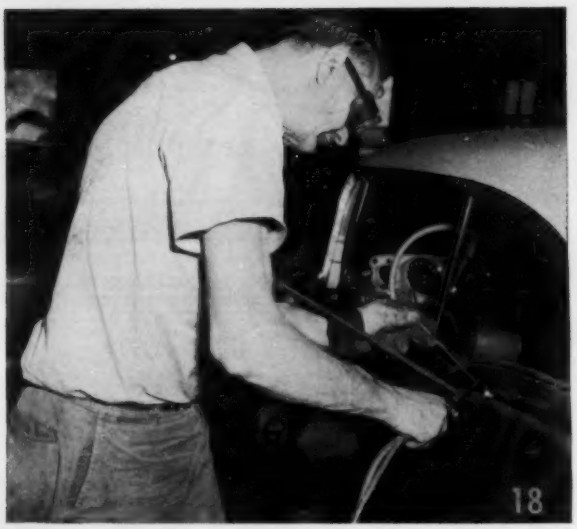
With the panel clamped in place, the next move is to spot weld at 6- or 8-inch intervals (Fig. 16) and to recheck alignment. Then clamps are removed, and any remaining rough edges or uneven areas, hammered down into alignment.

Look closely at Fig. 17. Here, the body man is forcing the panel back slowly near the top of the door as he spot welds the panel to the body. Much time is saved in final fitting by keeping an eye on the clearance around the door and the trunk lid while the preliminary welding is being done. Actually the body man maintains the same clearance at the rear of the door as at the front by very careful prying of the parts concerned while doing the preliminary welding.

Assured of his alignment at the door (the rear of the panel already being clamped into alignment) the body man now proceeds to put spot welds along the top of the panel. These welds are made at about 8- or 10-inch intervals to avoid overheating and buckling. But note that rod that the body man seems to be leaning on in Fig. 18. Remember he had "beefed up" the body metal by bending over the edge in Fig. 14. He'd been very sure to have this

(16) Panel clamped in place and being spot welded to retain alignment.

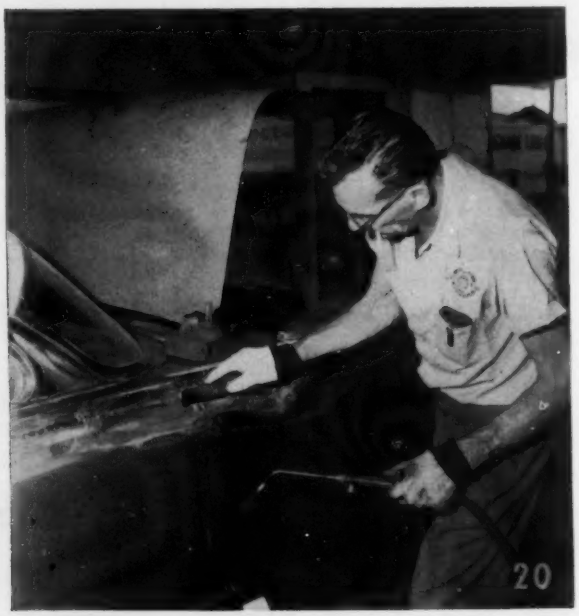
(17) Using screwdriver as lever to maintain clearance between door and panel while spot welding. (18) Pressing against panel: rod is held in place with body pressure while spot welding.



straight and true. Now he is using a length of ¼-inch rod about 14 inches long and with a disc on one end (so it won't "stab" him) to hold the panel tight to the body while spot welding. Remember these welds were made at about 8- or 10-inch intervals.

Final alignment inspection precedes completion of the welding job. Note in Fig. 19 that the weld is now almost continuous. It was made without buckling, by working alternately back and forth to avoid concentration of excessive heat. Some mechanics hammer such a weld slightly below the surrounding surface or grind down any high

(19) Tinning well-sanded body and panel about 2 in. above and below an almost continuous weld. (20) Using torch and paddle to smooth body metal applied to tinned surfaces.



spots before finishing with body metal. In this case grinding or hammering was unnecessary due to slight curvature of the edges of the panels.

The job being done in Fig. 19 is tinning for a distance

(21) Smoothing off repair job with disc sander, using No. 24 grit. (22) Belt sander, using No. 50 grit, to put on the finishing touches.

of about 2 in. both above and below the weld. Cut muriatic acid or commercial tinning solvent is used on a job of this kind. As will be seen in Fig. 19, the tinning is done with wire solder. This is followed up with body metal or lead smoothed out with the alternating application of heat from the torch (Fig. 20), and the "buttering" application of the paddle.

With the joint smoothly leaded, the disc sander goes into action (Fig. 20), and we now see a car that is practically ready for the paint shop. Some difference between the condition first seen in Fig. 2 and as shown in Fig. 21! But Slim still isn't satisfied. While it is true that the painter will "kill" the acid and add a few finishing touches to the surface before painting, Slim brings the job to surprising smoothness with a belt sander (Fig. 22). Now it would take a really sensitive touch to find the joints where this new smooth panel unites with the original body metal of the car.

Sun Gas Blends Reflect HP Trends

Regular gasoline is recommended for eleven 1959 model cars, compared to six of the 1958 line, in the custom-blend recommendations of Sun Oil Company . . . indicating an interruption of the steady climb in horsepower, according to the firm. Sun, which offers six blends over an octane range of 94-102, currently specifies gas of higher octane rating for three cars. Nine of the '59's call for lower octane ratings than their 1958 predecessors; 23 are unchanged.

Sun's Blend 260—the highest octane—is suggested for five of this year's models, compared to six of the 1958. Power increases are not limited to "luxury" models, nor are decreases to medium and low-priced, according to the oil company's research. As examples, the lowest-priced Buick, "LeSabre" is listed for Blend 240—compared to the lower Blend 230 for the comparable '58 model; while the Oldsmobile 98 for '59 rates Blend 240, compared with 260 for last year's model.

Higher-than-'58 octanes are specified by Sun for all new Buicks and for the Chrysler New Yorker. Decreases are specified for the standard Chevrolet V-8, all Edsels, all Mercurys, the Oldsmobile Super 88 and 98, and all Fords except the six-cylinder (unchanged at Blend 200).

When Installing Willys Warn Hubs Be Sure Clearance Is Adequate

Reports from the field indicate that, in some cases, difficulty is being experienced in installing Warn Hubs. The difficulty is the result of interference between the hub and the snap ring on the end of some axle shafts.

To correct this difficulty, grind the tabs on the snap ring sufficiently to remove all interference between the hub and the snap ring. Failure to provide adequate clearance at this point may result in damage to the hub when the vehicle is operated.

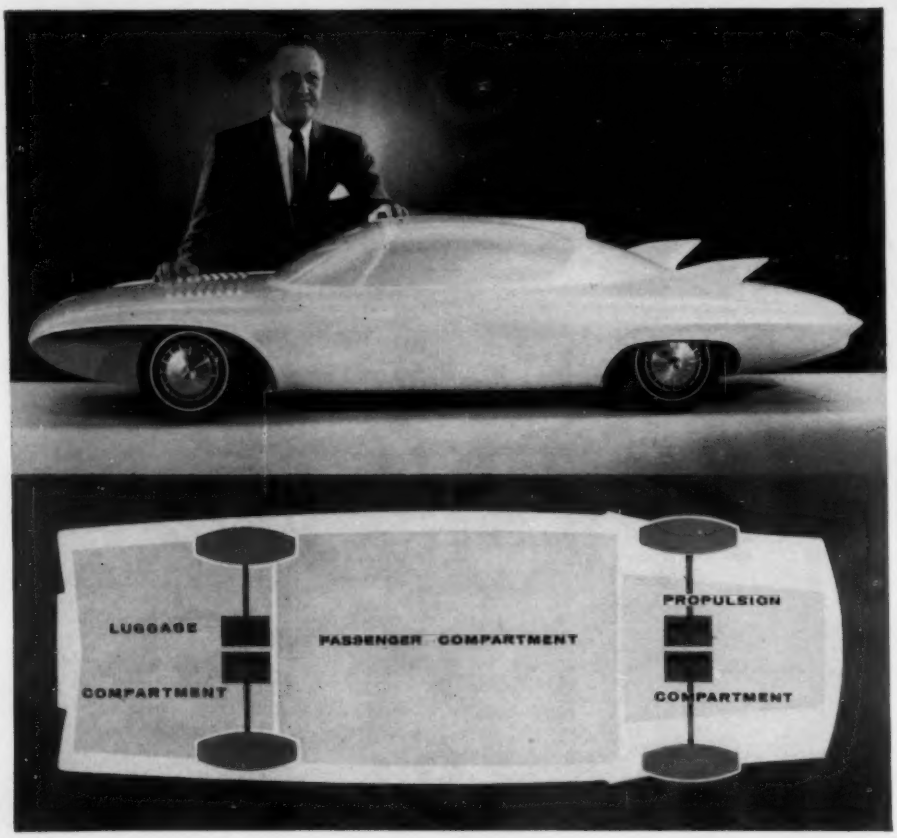
"Moogswagon" to Travel Country Answering Front End Problems

Answers to major questions and problems of alignment men have been developed by Moog Industries, Inc. into an exhibit fitted into a specially designed Volkswagen van. In addition to panels showing problems and solutions, the "Moogswagon" has a built-in movie screen that will show a film on the successful operation of an alignment shop or department.

The unit will travel over the U.S. and Canada, bringing the Moog alignment story to various clinics, regional and national automotive shows.

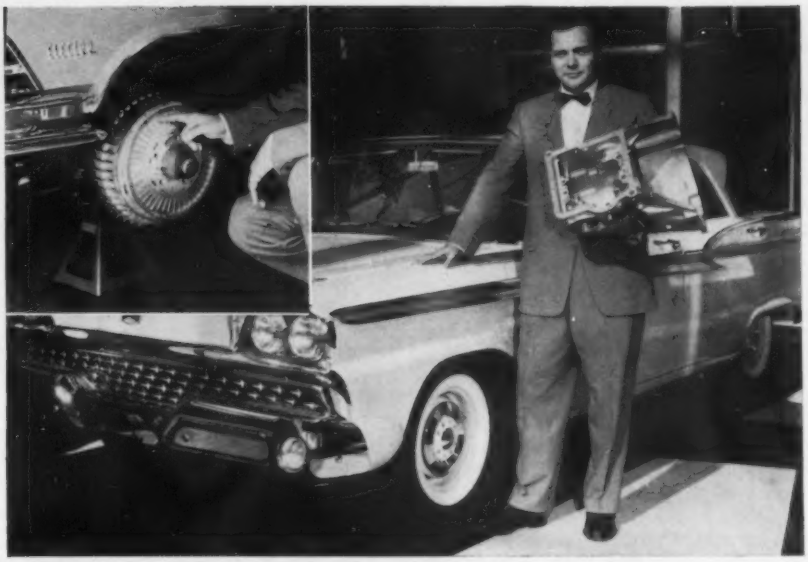
Fireman points to a 1 in. thick insulating mat, created by fire-retardant paint, which stopped flame spread in a 25′ x 25′ barracks at Otis Air Force Base, North Falmouth, Mass. Interior of this building had been treated with Saf. The cellular "puff" shown can be removed with a putty knife and the unmarred under-surface is ready for repainting.

Right: Fire rages in a 25′ x 45′ barracks while the adjoining, set afire at the same time, remains impervious to the flames. Latter was treated with a new fire retardant paint called "Saf" (stops all fires), recently introduced by the Alim Corp. of New York.



A. E. Kimberly, De Soto chief engineer, examines revolutionary "idea car," De Soto Cella I. Cross-section shows four high-speed electric motors which would drive, through short universal-jointed shafts, independently suspended shafts. Transmission, differential, driveshaft and rear axle are eliminated. An electromechanical principle would power the car.

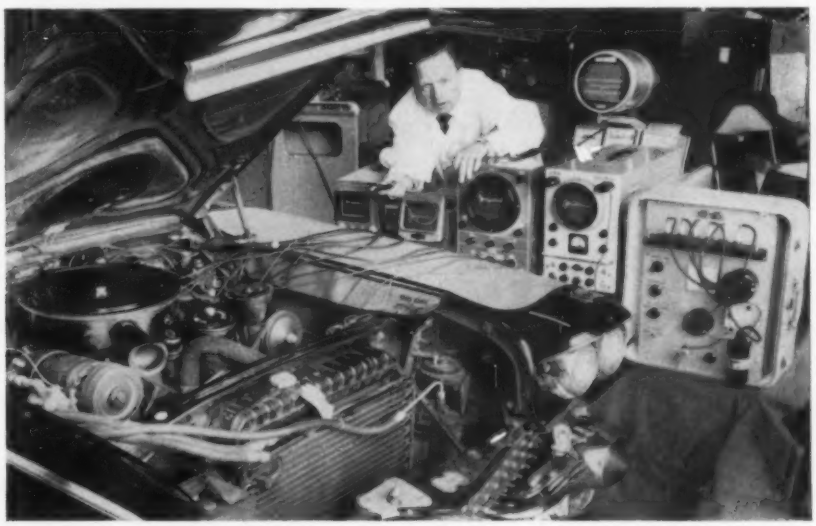
A 23-lb. transmission housing, cast by Aluminum Company of America, contributed to total aluminum use of 59 lbs. on this year's Ford. This compares with the 1959 all-car average of 51.6 lbs. of aluminum. Inset: Aluminum brake drum is part of a 74-lb. family of light metal parts on the 1959 Buick. A recent Alcoa survey disclosed that American 1959 cars utilize an average of more than 51 lbs. per car.



PHOTOS from here and there

Being demonstrated here is the lightweight characteristics of reinforced fibreglass used to mold the cab of the new White 5000 truck. Each square foot used is 6 lbs. lighter than steel.

This big 10-ft., 9-ton wheel at Firestone Tire & Rubber Co., can revolve up to 311 m.p.h. It is used for testing military and civilian aircraft tires.



The ease with which modern engines, buried under a maze of power equipment, pumps, and other items, can be checked for ignition trouble is demonstrated by John P. Finsland, of Shell Oil Co., with several oscilloscopes. Actually, of course, only one is needed for quick accurate checks in engine tune-ups. The unit on the right is an engine simulator.

DANGER . . . tire valve detour

• SINCE 1955 all passenger cars have rolled off production lines on tubeless tires, the changeover including the rubber - covered snap - in tire valve. Since this change makes the valve "part of the rim," rather than the tube, it could turn out to be a blow to good automotive service practice. Before tubeless tires, a used valve was automatically discarded with replacement of a worn tube. But with the tubeless tire, a worn valve can be left in the rim when the tire is replaced.

Widespread ignorance about the service life expectancy of these valves is indicated by the alarming fact that *millions of drivers and their passengers are "riding on" replacement tubeless tires sealed with carry-over valves that have already served the full service life for which they were designed.* A "second life" in a replacement tire or retread, is asking *far more* of the tire valve than is expected of the original tire.

First generation tire valves in second generation tires can only subject tires, drivers and passengers to grave danger.

Because this is a "need-to-know" state of affairs, A. Schrader's Son, oldest and largest manufacturer of standard tire valves, has assembled the facts to support the recommendations of the tire, automotive and petroleum service industries — that every new tubeless tire or retread should have a *new* valve.

Tubeless tire valves give reliable service for the life of a tire — but not for the life of the car! The standard tire valve has been designed and built to outlast the best tire. When tubeless tires were introduced, the method of making an air-sealing tire valve attachment changed completely. The seal is now made to the rim itself, where previously it was cured to the tube and merely projected through the rim hole.

SEAL BY COMPRESSION

The base of the tubeless tire is "snapped-in" to the rim hole plugging, thus sealing the rim hole by the compression of the ingeniously designed rubber base of the snap-in type valve. An indexing ring tells visually when the valve is in seated position.

An important margin of safety is built into the snap-in type valve, but eventually fatigue sets in and, like other products made of rubber, the material grows weaker when service is over-extended. A water test may not show that the valve is leaking after the tire with which it first "served" is worn out; but this is no guarantee that the old valve will not start leaking before the replacement tire gives full mileage. The elasticity necessary to provide the proper compression cannot be measured visually. Since the shop cannot determine by the water test or visual inspection just how much service life is left, a new valve is the logical and simple answer.

When a carelessly mis-mounted wheel cover leans on the valve, the shifting of the cover against the valve mouth may literally grind the valve down to the condition shown here.

Typical example of the effect of aging and prolonged compression on rubber covered valves squeezed into rim holes. Note the difference in diameter at the sealing area between new valve at left and one removed from a rim after extended service.

AGE AFFECTS ELASTICITY

Rubber eventually loses its characteristic elasticity when it remains static for long periods of time. Since

Removing and discarding a tubeless valve that has served the full life of its tire, should be a regular practice. Removing the old valve and inserting a new is easy with available mounting-demounting tools.

tubeless tire valves are metal inserts covered with rubber, the seal to the rim depends on a pliable rubber base. Leaving the original valve in the rim for service with the next tire can be dangerous because the original valve rubber is old as contrasted to the replacement tire rubber.

REMOVAL TEARS SEATING SURFACE

Once snapped into the rim, a standard tire valve forms a permanent seal —for the life of the tire. Pulling a valve through the rim hole accidentally, or for possible salvage and re-application, permanently mars the sealing surface and weakens the original sealing qualities without necessarily leaving visible signs.

These facts should be enough to convince any serviceman that he should never re-use an old valve, nor replace a tire without also replacing the valve. Insertion of the new valve is easy and quick with the simple mounting tools available. On the other hand, the saving of the negligible cost of the new valve is far outweighed by the risk to the customer's safety.

HEAT, COLD AND OZONE CRACKING

Summer heat, winter freezing, ozone cracking and mismounting of rim covers are every-day operating conditions and occurrences. A valve used for one full tire life does not have the resistance against them that it had when fresh, even though this valve may still test airtight. Road hazards, oil, tar, extreme temperatures and long exposure are factors that modify both tire and valve life *simultaneously*. Tubeless tire valves are subject to the usual day-by-day abuses and punishment that have always menaced tube-type valves, for example entry of dirt, and damage to the valve mouth.

FRESH CORE AND CAP

Tubeless valves have standard replaceable and interchangeable caps and cores, as have all valves made since the earliest pneumatic tire-equipped vehicles. Dirt can easily work into any valve mouth that is not protected with a valve cap. Schrader recommends periodic inspection of all five valves of a car (including the one on the spare). This can take place during the fixing of a flat, when the car is on the "lube" rack, or during any service work. A fresh core and cap is good service practice.

WHEEL COVER ALIGNMENT

Valves protrude through holes in ornamental wheel covers provided for many current car models. These holes must line up with the valve's location. Mis-aligned ornamental wheel covers shift tire valves at acute angles, producing severe strain on one side of the valve. Wheel covers that are carelessly mis-mounted so they lean on the valves have been known to *grind them away* as they shift against the valve's mouth.

As a standard practice, attention to tubeless tire valves certainly seems a worth-while service from the standpoint of the car owner and the service shop alike. New valves are a minor investment for the motorist, likely to bring him a great return in safety and tire service life. The shop should charge for the service, of course; and the difference between that low cost and the price of a tire to replace one by failure of a carry-over valve, should appeal to the customer.

Probably most important of all, the minor business transaction involved in inspecting and servicing the valves "pays-off" in peace of mind for both parties concerned.

When a valve is pulled through the rim hole accidentally or in attempted salvage and re-use, its original sealing surfaces are permanently marred, although the extent of the damage is not always apparent to the eye. The valve shown has had its seating surface visibly torn by such handling.

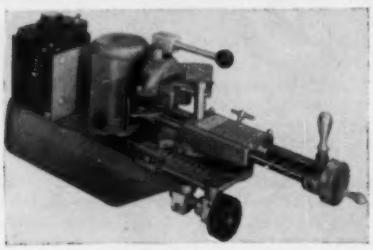
These are new *manufacturers' products*

HOW TO GET RUSH INFORMATION

If you want further information or literature describing the products shown in our "These Are New" pages, just use the handy Business Reply Card you'll find further back in this issue. Whether you want information on one or more of the products, all that is necessary is to mail this Postage paid card properly filled out to AUTOMOTIVE SERVICE DIGEST. Our Reader's Service Dept. will contact the manufacturers directly and see that you obtain the requested information as quickly as possible.

Radius Brake Shoe Grinder

To reduce time, effort and expense in providing a correct fit of brake shoes to drums, Barrett Equipment Co. announces a newly designed, factory pre-set cylindrical bench type



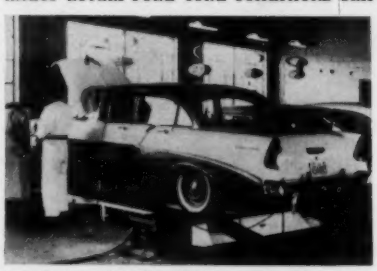
radius grinder, which includes a powerful, built-in blower for positive dust collection.

The new cam lever lock shoe holder provides instant clamping of shoes, including Rambler, Chrysler Center Plane and new type Bendix . . . grinding eight shoes in approximately four minutes. The abrasive sleeve is renewed, when necessary, in seconds.

(Circle No. 1 on Reader Service Card)

Road-Load Test Installation

Car and light truck performance under actual road-load conditions can



be determined indoors with the new Bear "Loaded Autorol," which is featured this month at the I.A.S.I. Show, according to the firm. Newest addition to the Bear line of safety test and correction equipment, this installation incorporates a movable Test Tower. The tower serves as a control center for the Autorol and Load unit; and contains speed check meter, engine load gauge, hydraulic pressure gauge and gasoline flow gauge, as well as hydraulic pump control handle and knob for simplified load control.

It is described by the maker as moderately priced, exceptionally easy to use, simple to install with either rack or pit.

(Circle No. 2 on Reader Service Card)

6/12 Volt Battery Chargers

Two new chargers are announced by Fox Products Co. which permit easy overall testing on both 6 and 12 volt batteries without prodding the individual cells or connecting any wires.

Model 592 is controlled by an electric timer; Model 593 determines charging time automatically by the company's Safetronic Control.

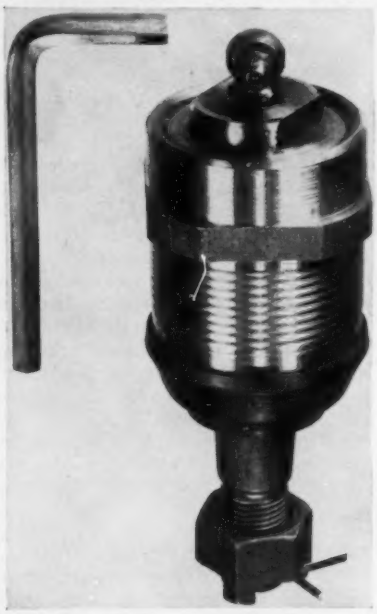
A Supertester, built into each model, permits fast, accurate testing: The leads of the tester are clamped to the battery posts and readings are taken from a large, easily-read meter. Four tests are made: the amount of charge in the battery; the battery's condition under open circuit; the battery's condition under a load which is built into the tester; the car charging system. Variations from normal can be detected instantly.

Other important features include a new Silicon rectifier in a powerful charging circuit that easily charges even cold batteries, new pushbutton controls for simplified fast or slow charging, and new chrome front panels for attractive appearance. Output is 100 amps at 7.4 volts, 50 amps at 15.5 volts. Automatic circuit breakers avoid damage from shorts or reversed connections. Chargers are cooled by sealed-lubricant lifetime fan motor.

(Circle No. 3 on Reader Service Card)

Adjustable Ball Joint

An adjustable Ball-Joint Unit (K-710), designed to eliminate lower ball-joint looseness in 1957-59 Plymouths and most models of 1957-59 Dodges



and 1957-58 Chryslers, has been announced by Moog Industries, Inc.

The unit permits all stud-end play to be eliminated with a simple adjustment requiring only an Allen wrench . . . the adjustment being made after the unit has been installed. Chief advantage of this custom ball-joint adjustment is that it makes possible a close tolerance front end alignment job that will give the car owner better steering and tire life.

(Circle No. 4 on Reader Service Card)

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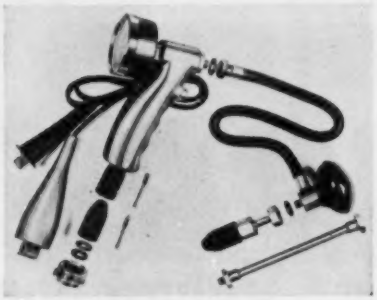
These are new *manufacturers' products*

Hanson Combination Test Unit

Latest addition to the Hanson line of testers is the Model 33—a universal compression tester that features flexible and rigid extensions and incorporates a handy, built-in remote starter switch.

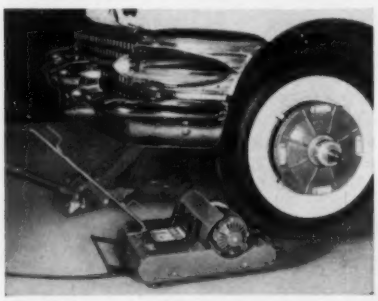


This push-button remote starter switch is located right on the pistol-grip handle of the tester. Easy, trigger control of the starter with the same hand that holds the tester is said to greatly simplify taking a compression reading—one hand does the work of two.

(Circle No. 5 on Reader Service Card)

Money-Saving Wheel Balancer

For shop operators who want the greater speed, accuracy and profit-potential available with a Tune-In, on-the-car type wheel-balancer, for a minimum initial investment, Hunter Engineering Co. announces an Economy Series in eight different balancer models, featuring varying combinations of spinner power-choices, with or without the handy, caster-wheeled, seat-cabinet.



The Hunter 107-A Tune-In balancing instrument, included with deluxe models, is standard equipment in all Economy groups. Also included are the new 14" and 15" wheel adaptors which grip the entire perimeter of the wheel.

The lightweight and easy-to-handle Economy spinner is available in four power choices in single and dual-motor installations. The spinner is designed to be foot-controlled by the operator, while sitting, and motor and brake controls are conveniently positioned accordingly.

(Circle No. 6 on Reader Service Card)

Multi-Purpose Infrared Drier

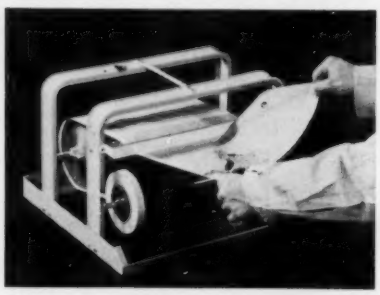
New low-cost all-purpose unit has radiant area 44x66 in., readily adjustable to conform to various car contours. Uses 24 G-30, 250W lamps and a total connected load of only 4.2 KW. Bottom bank of lamps is only 12½ in. from the floor, to meet the requirements of today's low body lines. Introduced by Fostoria Pressed Steel Corp., the portable panel has overhang designed to handle any paint baking job—fenders, doors, hoods, tops and rear decks.

Its design is intended to eliminate "hot spots" and costly overheating. A patented feature developed by the manufacturer, high-specular gold reflectors, is claimed to assure fast, uniform, penetrating heat from low-cost lamps. As "matched units," two or more of these Model 80-426 driers can be used together for complete paint jobs.

(Circle No. 7 on Reader Service Card)

Masking Combination

Two new apron tapers and a new, lower-priced line of masking paper are announced by Minnesota Mining and Mfg. Co. The combination is offered initially in Deal PTT, which features a 20% discount on the new portable tapers, with purchase of the new masking paper and "Scotch" brand masking tape.



The apron tapers, in 15" and 36" widths, will accommodate a single roll or combination of masking paper rolls up to those limits and feature easy conversion to double edge taping. According to the manufacturer, the adaptability of the tapers to multi-width masking, and their ability to dispense single or double-taped aprons, combine with portability to make them the most versatile apron tapers available.

(Circle No. 8 on Reader Service Card)

"Mike" Has New Spindle Lock

Micrometers manufactured by The Central Tool Co. are now provided with a new spindle lock which resembles a small, neat button. This replaces conventional clamp ring devices for locking the spindle at any desired reading.

To lock the spindle and preserve the setting of the tool, you merely press the button . . . readily done while tool is held in one hand. Pushing the button on the reverse side releases the spindle.

Circle No. 9 on Reader Service Card)

"Now, you're going to be unhappy with our bill for a few days . . . but you'll get over it!"

Transmission Jack

A special transmission jack (Model 700VW), designed specifically for removing and installing Volkswagen and Porsche engines and transmissions, is now being offered by the Edmund J. Wudel Mfg. Co.

With the car on stands or a dolly, and the skirt and rear bumper raised 30″ from the floor, this new hydraulic jack provides easy withdrawal of the

engine on the lowered jack. In high position, the jack can be raised to 30″ which makes installing or removing the engines a simple operation. Only one mechanic is needed to operate the jack, and with hands free to maneuver the engine, tilting is accomplished by rocking the adaptor with the engine on it . . . quickly lining it up with the transmission. The adaptor may also be set in a rigid position at any point over an 80° radius.

An 18″ extension handle is provided which actuates the hydraulic lowering releases and eliminates the necessity of the mechanic reaching down while working. A foot step-in bracket on the pump handle leaves hands free to work at all times. A slight foot pressure raises the jack to the precise height desired. This pump handle rotates a full 360°, enabling the mechanic to use either foot.

Freely pivoting swivel casters, ball-bearing mounting allows smooth, easy travel of the loaded jack over any floor.

(Circle No. 10 on Reader Service Card)

Improved Motor Tune-Up

To eliminate the damaging effects of modern stop-and-start driving on today's high compression engines, the Hastings Manufacturing Co. announces a new improved Casite, now called Casite Tune-Up.

In addition to all former Casite features, the new formula contains a blend of five new chemical ingredients which are said to prevent engine deterioration and wear.

Used in the gas tank or through the air intake for more power and smoother performance, new Casite Tune-Up is said to have the advantage of cleaning spark plugs and carburetor as well as freeing sticky valves and rings. Used in the crankcase oil, it is said to effectively neutralize acids. Consequently, in addition to eliminating gum and sludge, new Casite Tune-Up protects engine bearings against etching.

(Circle No. 11 on Reader Service Card)

Two Instruments in One

With a flick of a switch this combination voltmeter and tachometer instantly provides the following engine and electrical system checks:

1. 2% accurate, R.P.M. readings for proper gear shifting, automatic transmission and engine protection. 2. Bat-

tery voltage tests to check battery condition and short circuits. 3. Cranking voltage which checks starter, starter switch, cable difficulties, etc. 4. Generator voltage which checks generator, voltage regulator, battery and protects entire electrical system from high voltage burnouts.

Known as the Voltack, and offered by The Westberg Mfg. Co., the unit is available for in-the-panel or under-the-dash mounting and comes complete with installation and operating instructions.

(Circle No. 12 on Reader Service Card)

Dash Controlled Fender Mirror

A fender mounted rear view mirror is now available from The Roberk Co.

which has a dash-mounted control unit for quickly and easily adjusting the mirror up, down or side to side (housing remains stationary).

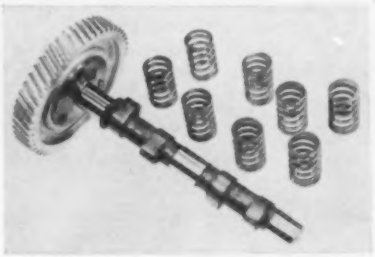
This all-angle adjustment is accomplished by means of a simple, mechanically foolproof device. Three cables run from the dash unit to mirror head and a push or pull on the control handle translates the same motion to the glass. Action is direct and is done with a minimum of parts. There are no gears or intricate parts to cause trouble.

(Circle No. 13 on Reader Service Card)

High-Lift Cams for Volkswagens

An increase in low speed torque and power plus improved acceleration, with no harm to idling, are now possible for the Volkswagen through use of a precision-designed, High-Lift camshaft and heavy-duty springs being offered by European Motor Products, Inc.

Adaptable to both sedan and transporter models in the Volkswagen line, the cam is custom-made and precision-ground from a new alloy steel



forging and thoroughly tested with proven results of substantial performance increase in the 2000 to 4500 r.p.m. range.

Also available is a full racing cam with more lift and more overlap. It is, like the Hi-Lift, not re-ground and will afford maximum power and speed in the 3000 to 6000 r.p.m. range.

A special set of eight, heavy-duty valve springs has been designed to be used with either cam. The springs are wound of tempered alloy spring steel to withstand the higher operating temperatures of the Volkswagen air-cooled engine.

(Circle No. 14 on Reader Service Card)

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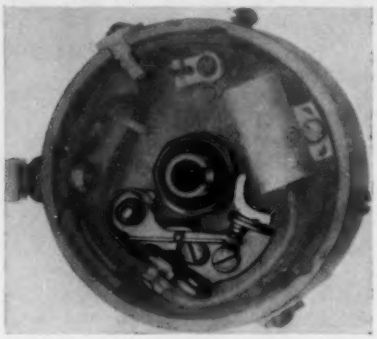
Continuously Lubricated Points

New line of Blue Streak "LubriPoints" for all popular cars features built-in "Lubri*Wick" for controlled cam lubrication. According to Stan-



dard Motor Products, the manufacturer, the sets are factory treated to hold enough special silicone lubricant that only a small amount need be added at the time of installation.

Once installed, "LubriPoints" are said to require no further lubrication for the life of the points, and to provide continuous lubrication of the high spots of the cam, where it is needed. The feature is claimed to prevent accumulation of grease on the cam flats, where it is necessary, to minimize rubbing block wear and prolong point life. Sets are pre-assembled for quick, easy installation.

(Circle No. 15 on Reader Service Card)

Paint Gun Pressure Regulator

New line of small circulating fluid regulators is announced by Binks Manufacturing Co. Attached to spray guns, the units are claimed to provide positive fluid pressure control at each gun individually, regardless of how many may be operating off a common pressure tank or circulating system. According to the manufacturer, the small regulators solve the problem of using any available system pressure; and finish pressure is not affected by circulating pressure.

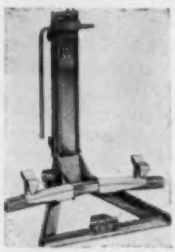
The regulators are claimed to eliminate discoloration caused by the settling of material in idle lines; to maintain the same pressure 30 to 50 feet above the ground as at floor level, without readjustment. Operators set desired pressure with a wrench while matching the gun spray pattern visually to that required for the job.

Heated materials are handled as easily as those at room temperature, the manufacturer reports; the diaphragm will withstand heat up to 200 degrees F, and is unaffected by finishing solvents. Regulators are available with single or double inlet for circulating or direct supply systems.

(Circle No. 16 on Reader Service Card)

One-end Lift for all '59's

Introduction of a new 1½-ton, one-end lift featuring variable bumper clearance to permit lifting any 1959 automobile, is announced. Designed with a wide-angle, V-type lifting beam, the unit is said to give bumper-to-bumper clearance from 9½ to 15 in. Distance between bumper and jack increases as the saddles are spread, in order to prevent "dinging" or distorting the bumper of any '59 model.



The Walker No. 99 "Handy Boy" has saddles that rotate in a full circle, adjust from 24 to 43 in. and may be reversed for a minimum spread of eight in., to assure firm safe contact. Also incorporates twin safety locks as extra protection against accidental lowering. Front caster deflects under load, allowing full V-bar base to contact the ground for stable support.

(Circle No. 17 on Reader Service Card)

Universal Shock Spring

Development of a new, universal shock spring to fit over existing shock absorbers on nearly every automobile and light truck has been announced by Thompson Products Replacement

Division. Called "Sky Ride," the new spring is of universal design and will fit 90 per cent of all cars and light trucks thereby minimizing large inventories and cash outlays by jobbers and repairmen.

Priced far below the current cost of many load-leveling devices, the spring is designed to prevent rear-end sag and bottoming in today's soft sprung vehicles. While "Sky Ride" eliminates these problems, it does not materially affect the vehicle's normal riding comfort.

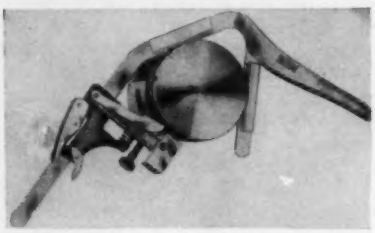
Easy to install and remove, it can be used only during overloaded travel if desired.

(Circle No. 18 on Reader Service Card)

Piston Regroover

A new, lightweight piston regroover for widening and deepening piston ring grooves on 2.6" to 5" pistons, is announced by the Zim Mfg. Co.

The control for the cutter is placed within the groove being worked on,



and consists of a spring-pressed pilot held securely in exact alignment with the cutter and at all times deeper in the groove than the cutter until it touches bottom, when it is gradually pushed back by contact to permit the cutter to finish the operation.

Pilots are furnished to fit 5/64", 3/32" and 1/8" grooves with a cutter .031" wider for each pilot; which is quickly changed by pulling out one and pushing another in place with the right size cutter.

(Circle No. 19 on Reader Service Card)

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TECHNICAL HELP FOR THE SERVICE SHOP

AUTOMOTIVE SERVICE DIGEST is specifically edited for the service specialists of the automotive industry . . . the men who keep automobiles on the road, performing at their best. From front cover through the "Smiles" page, all articles and departments are devoted to subjects and services that will help the man in the shop to do a better job, more profitably.

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●ONLY ASD provides the automotive service field with timely, authoritative, detailed articles of this type. Prepared by men who have the actual experience, as well as the education to "live with" the increasingly specialized service needs of the modern automobile, these features go deeply into the methods and mechanical parts involved. Most "Tech Know-How" write-ups are step-by-step "how-to" descriptions of the latest procedures in a key servicing operation.

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● Covering the "dollar sign" side of our readers' information needs, ASD "Business Know-How" articles present management subjects from the specific automotive service shop viewpoint. They are written for owners and supervisory personnel, by authors of recognized business-management ability; and are based on the actual day-to-day problems of a going automotive service establishment.

AUTOMOTIVE SERVICE EDUCATION

● Toward the solution of one of the most acute needs of our industry, AUTOMOTIVE SERVICE DIGEST carries a continuing series of reviews on how and where the skilled technicians of tomorrow are being trained. Going deeply "into cases," the Service Education series answers the questions of prospective student and management alike.

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Impact Wrench Line Expanded

With the addition of seven new models, Albertson & Co., Inc., has sharply expanded its line of Sioux air impact wrenches and air screwdrivers. The company has also added five new models to its line of electric impact wrenches and electric screwdrivers.

Smallest of the new air impact wrenches is the Model 313 and 314. While it weighs only 2¾ lb. it will deliver 95 ft.lb. of torque, and features a remote air exhaust system which

carries exhausting air and oil six feet away from the operator. This model fits naturally in the hand, is operated with a paddle switch, and is used extensively for transmission work.

At the other end of the torque range are the Models 320 and 322 air impact wrenches which are said to achieve a new high in power to weight ratio; the Model 322 delivering 1200 ft.lb. of torque with 120 lbs. of air pressure at the tool.

The entire line is "Raction Balanced," meaning that the operator does not experience the usual pull as the wrench impacts.

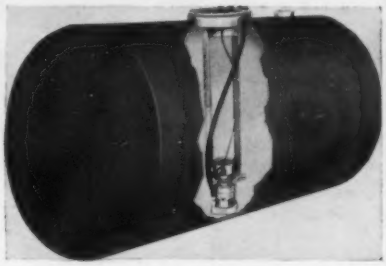
(Circle No. 20 on Reader Service Card)

Electric In-Tank Fuel Pump

A new In-Tank Electric Fuel Pump for motor trucks is announced by Tokheim Corp. which "pushes" fuel to the carburetor from the bottom of the fuel tank and does not depend on suction as do conventional, mechanical and electric pumps.

Designated as the Tokheim Model 558, the new pump fits any standard safety tank—cylindrical, step or saddle-type. It is suspended from the top of the tank by an adjustable hanger which has a 12" to 26" range. The pump mounting is cushioned in rubber to dampen vibration. Even though the entire unit is submerged in the fuel, the hermetically-sealed electric motor, operating the pump by magnetic drive, assures safe installation and the elimination of corrosion.

With the In-Tank Pump, the driver



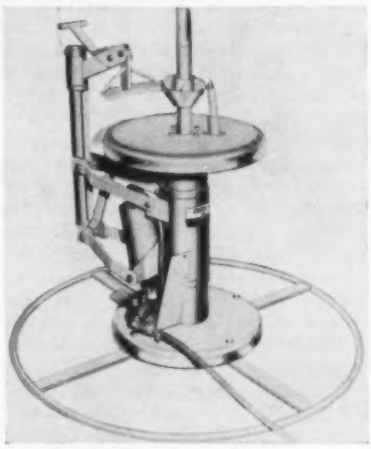
starts fuel flowing before the truck engine actually starts, either by dashboard primer switch, or through magnetic relay when touching the starter button. Thus, the common problems of "cold" starts, high altitudes and engine starvation are said to be eliminated.

The manufacturer also claims the new pump positively eliminates vapor-lock; outlasts any conventional pump; maintains constant pressure and full fuel flow under all driving conditions; and permits open-throttle driving without burning out valves. An important safety feature is the special oil pressure switch which automatically stops the pump if the engine stalls.

(Circle No. 21 on Reader Service Card)

Combination Tire Tool

According to the manufacturer, the new Coats Company combination tool can be used with any tire-changing equipment that incorporates a center



post; and handles all tire sizes from 12 to 21 in. in diameter. The new product designed with mounting and dismounting features, will be displayed at the I.A.S.I. Show this month. It is claimed to be particularly suitable for preventing damage to tubeless tire sealing surfaces.

(Circle No. 22 on Reader Service Card)

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These are new *manufacturers' products*

Jack-Pack Merchandiser

A new merchandiser rack is announced by Jack-Pack Mfg. Co. for featuring their complete stock of popular hydraulic jack repair kits and hydraulic jack oil.

The Jack-Pack hydraulic repair kits contain illustrated instructions and all the working and wearing packings necessary to restore a jack to efficient trouble-free operation.

(Circle No. 23 on Reader Service Card)

Transmission Jack

A new, low-cost high-range transmission handler has been developed by Auto Specialties Mfg. Co. to lift, lower and position heavy transmissions under car-lifts or hoists. The Ausco Model 2300, with a rated capacity of 1000 lbs., requires only a seven pound pull to spin the large operating handwheel and lift any pas-

senger car or light truck transmission. Automatic lowering is controlled through a convenient foot-pedal release.

The extremely smooth, easy operation of the jack comes from having all working parts of the lifting mechanism move on ball bearings. The large diameter lift screw is precision machined and operates through a recirculating ball bearing nut.

Positioning adaptor fits all transmissions, including '50, '51 and '52 Powerglide. Adaptor tilts 65° forward permitting transmission housing to clear frame cross members when lowering transmission . . . controlled 15° side tilt and 7° rear tilt permit easy matching of dowel pins and bolt holes.

Four base legs with swiveling caster wheels give maximum insurance against tipping and easy mobility.

(Circle No. 24 on Reader Service Card)

Transmission Housing Inserts

New kit assortment of Heli-Coil stainless steel wire inserts contains four sizes for repairing all tapped holes in the aluminum Ford-Edsel automatic transmission housing. Recommended, according to the manufacturer, in the 1959 Ford Shop

Manual, the inserts are used in the repair of worn, damaged or stripped threads. The kit contains all necessary tools and an assortment of inserts in the required sizes; and is designed for years of use by simply reordering inserts as needed. Its inside cover explains and illustrates the three-step repair procedure.

Inserts are claimed to make possible repair and salvage of housings ordinarily scrapped. They restore the threaded holes to original size, thus making oversize screws, bolts and studs unnecessary; and being completely covered by the bolt, are not visible after reassembly. The wire thread inserts are described as heat-resistant and not subject to corrosion, seizing or galling under high temperature.

(Circle No. 25 on Reader Service Card)

Electric Tachometer

Especially designed for high speed engines, "ElectroTach 57" gives direct readings of speeds up to 8500 rpm; is suitable for most cars in the sports field. Introduced by Dixson Products, it can be used without modification or adjustment on six- or eight-cylinder models; with six- or twelve-volt ignition or magneto. Can be transferred from one car to another; mounted on or above dash, or on steering post.

Features include gold-plated relay points; D'Arsonval movement; Alnico magnets; zero adjustment; mercury cell power source, not affected by fluctuations of car battery voltage. Has 3¾" chrome-finish face; indirect dial illumination. Carries one-year warranty.

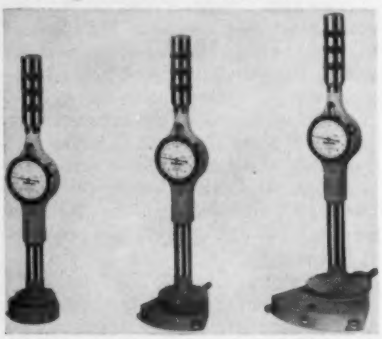
(Circle No. 26 on Reader Service Card)

Dial Bore Gages

Designed for inspection as well as checking hole sizes during machining or grinding operations, these new Starrett No. 84 Series Dial Bore Gages will measure bore diameter in ten-thousandths or half-thousandths, depending on the model chosen, and will indicate variations from true bore such as taper, out-of-round, bell mouth, hour glass or barrel shape.

Made by The L. S. Starrett Co. in three sizes to cover a range of 3 to 12⅛ in., they are available in six models to provide a choice of indicator readings in .0001" or .0005".

Design features include: aluminum



handle, indicator housing and gaging head for light weight and easy handling; simple adjustment for wide measuring range by means of an adjustable and interchangeable, positive locking range screw; self-centering in bore with two spring-loaded centralizing plungers and the range screw providing three-point wall contact; separate spring-loaded gaging contact for accurate, reliable, repetitive readings.

Gaging contact, centralizing plungers and range extension screws are normally hardened and tempered tool steel, but carbide tips are available on special order.

(Circle No. 27 on Reader Service Card)

Say You Saw It In
Automotive Service Digest

Repair Estimating and Billing with

National Auto Parts & Labor Manuals

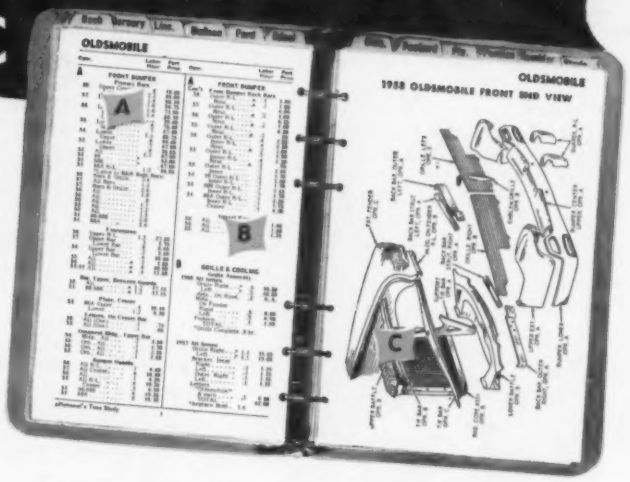
Simple as: A-B-C

A LABOR CHARGES. Official time studies* in hours and tenths. Automatically figured at *your* hourly rate.

B PARTS PRICES. Factory list prices cover all makes, all body styles for past eight years—convertibles and hardtops included.

C ILLUSTRATIONS. For quick identification—fast and accurate body shop estimating and billing. This section shows exploded views of front and rear suspensions, grilles, power steering—front sheet metal including sub-assemblies and bumper—body diagrams, indexed by make.

*Where no factory flat rate exists, labor hours are based on National's Time Study.



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(MF)

These are new *manufacturers' products*

"Non-Destructive Recovery"

New semi-heavy duty wrecker, Model 19-51 EXB, has been introduced by Ashton Sales, Inc., as designed especially for the recovery of modern high-styled cars and trucks. According to the maker, it is the result of extensive research and testing into the best methods of recovering disabled vehicles without damage to stylish bodies. Designed for mounting

on any 1½ to 2-ton cab and chassis with heavy duty springs and four-speed axle, Model 19-51 EXB is meant for handling and towing all passenger cars and most medium trucks.

Its boom telescopes up to 169 in. to permit reaching over the damaged vehicle and lifting it from its position. That method of retrieving is said to prevent the type of damage that results from dragging a car or truck from the site of an accident. Standard specifications are: winch—22½ tons with one-half in., 300-foot cable; full rear controls; telescopic boom extending from 109 to 169 in, with variable height of zero to 80 degrees. Height of boom with or without load is controlled by a separate winch. The wrecker body is offered in a variety of styles and constructions.

(Circle No. 28 on Reader Service Card)

New-Design Files

Introduced by Heller Tool Co., "Criss-Cross Multi-Kut" files feature a unique pattern described as a new

concept in file design. It incorporates double diagonal chip-breaker grooves; has been field and factory tested.

According to the firm, the combination of vari-length teeth and criss-cross grooves roughs to size and smooths to finish in fewer strokes, with less pressure on tough, dense metals and less loading on soft. Each section of the pattern has flying-wedge action for faster penetration; widening teeth to hog off metal in time-saving bites; narrowing teeth to finish to smoothness. The files are available in flat, half-round and square shapes, and in 8-, 10-, 12- and 14-in. sizes.

(Circle No. 29 on Reader Service Card)

Trunk Drain for '59 Chevrolets

Water always flows downhill . . . and in the 1959 Chevrolet, downhill is said to be inside the trunk area when rain rolls down the forward angle of the trunk gutter.

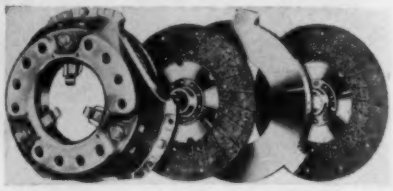
To overcome this difficulty, Houser Engineering & Mfg., Inc. has developed a Trunk Drain Kit which channels the flow through a simple tube with special brass drain fittings. Easily installed at the forward corner of the trunk gutter, a drain fitting holds a rubber tube which carries the water out through the floor of the trunk section.

The Kit provides 2 each of special brass drain fittings, rubber washers, steel washers and nuts, plus ample rubber tubing to drain both corners, complete with clear, easy instructions.

(Circle No. 30 on Reader Service Card)

Heavy-Duty Clutch

Production of a 12-in., two-plate DPB direct pressure clutch for truck, tractor, bus and industrial use, is announced by Lipe-Rollway Corp. To be introduced at the I.A.S.I. Show this month, the new clutch has maximum release bearing load of 470 lbs. at full release. It is claimed to have higher burst strength and greater torque with lower pedal pressure than previous models.



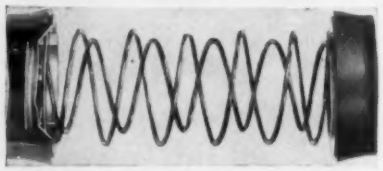
Drive mechanism has been simplified for more perfect alignment between plate and engine flywheel. Positive retraction of the intermediate plate during disengagement is accomplished, according to the manufacturer, by a compression type spring.

(Circle No. 31 on Reader Service Card)

Double Action Expanders

Otto-Items, Inc., manufacturers of Tru-Torque Safety Cups, have developed a new Double Action Expander that can be used with any conventional cup.

This expander has a return spring in the center to give positive return of



cups to relaxed position . . . lighter tension outside springs works only on the expander. This gives the desired combination of pressure for light expander action . . . and heavier positive pressure to insure cup return, eliminating all possibility of sticking cups due to expander action.

(Circle No. 32 on Reader Service Card)

"It was easier to train the dog than all the mechanics."

Self-Tapping Drain Plugs

Stripped threads on original oil pan plugs no longer mean costly repairs or replacements—not when the heat-treated, self-tapping, oversize drain

plugs being offered by O.E.M. Products Co. are used.

These plugs are easily screwed into the pan openings, making their own threads for a tight, drip-proof plug installation. Double oversize drain plugs are also available for threads stripped in crankcase when installing oversize plug 38.

(Circle No. 33 on Reader Service Card)

Moderately Priced Compressors

Champion Pneumatic Machinery Co. announces a new line of compressors called "Challenger," priced in a lower

range than the standard Champion line.

Challenger compressors are available in the range of 1 to 3 hp., with 5.1 to 12.24 cfm displacement. The Challenger motors, switches, controls and tanks are exactly the same as those used in the company's more expensive line.

(Circle No. 34 on Reader Service Card)

Paint Spray Guns

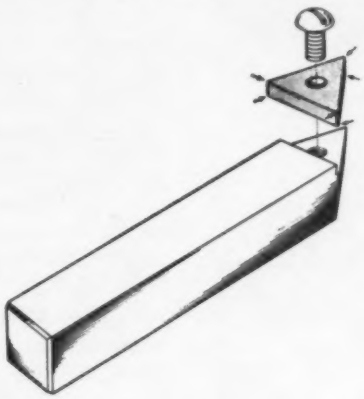
Both bleeder and non-bleeder types, with internal and external mix as well as pressure and siphon feed, are included in the nine guns of a complete new line introduced by Campbell-Hausfeld Company. Simplified design to make spray painting easy for anyone, is featured, the firm says.

All units have standard pipe size connections (¼" for air, ⅜" for materials), and operate at pressures of 30-50 psi. High-capacity ten-hole fluid tips, interchangeable internal-external mix air caps, and adjustable spray width controls, are available for most models in the line. Features include pistol grip handles; lightweight alloy construction; reduction in the number of parts and of recessed areas, to speed cleaning; easy adjusting controls.

(Circle No. 35 on Reader Service Card)

Multiple-edge Cutting Tool

Time and money savings are claimed for the new "Trucut" Brake Drum Cutting Tool just introduced by Frank N. Wood Company. Available in models to fit lathes of all makes, the tool features six cutting edges. As one is dulled, the triangular carbide in-



sert is turned to place a new edge into cutting position.

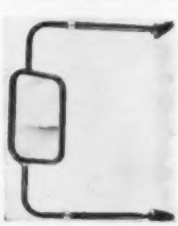
Six-edged replacement inserts are obtainable at such low cost that it is practical to replace, rather than resharpen, according to the manufacturer. Cutting insert is secured in its holder by means of a lock screw and a retaining shoulder. The holder section of the tool can be reused indefinitely.

(Circle No. 36 on Reader Service Card)

Clear-Vue Truck Mirror

The Grote Manufacturing Co. announces a completely new truck mirror . . . to be known as the Junior Clear-Vue mirror, with a mirror head measuring 6" x 9".

The replaceable mirror glass is top quality, double strength and its silvered surface has a double protective coating to prevent weather deterioration. Specially designed rubber rim protects mirror against breakage. The formed steel housing has a black baked enamel finish—cadmium plated



universal center swivel with sealing gasket. Double plate ball socket with three screw adjustment makes for positive adjustment.

The 8" extension arm (No. 888) has maximum vertical adjustment of 25" and a maximum horizontal adjustment of 16", while the 10" extension arm (No. 889) has a maximum vertical adjustment of 18".

(Circle No. 37 on Reader Service Card)

Pit 'N' Hoist Jack

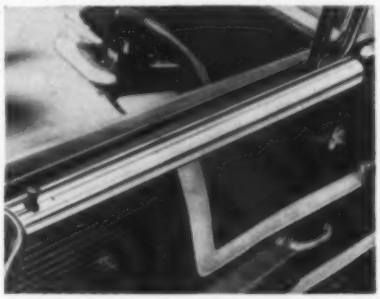
The Branick Mfg. Co., Inc., announces a new portable Pit 'N' Hoist Jack to raise a car easily and safely for a one-man operation in removing and installing parts where it is essential that the weight of the car be removed.

The jack has a capacity of 1500 lbs. lift at 100 lbs. air line pressure. Light weight and convenient handle permits jack to be quickly moved from one end of car or job to another. It has a minimum height of 58" with sleeve retracted. Maximum height with sleeve extended is 74". Overall height with 12" stroke is 86".

(Circle No. 38 on Reader Service Card)

New Garnish Moldings

Recently introduced by Auto Ventshade, Inc., "Garnishields" is a molding designed for 1959 General Motors



cars. Custom-made for both front and rear doors, the moldings are designed to run the full length of the window and protect the upholstered ledge against wear, weather and perspiration. Construction is of polished stainless steel. The units are claimed to be quick and simple to install with the use of two screws.

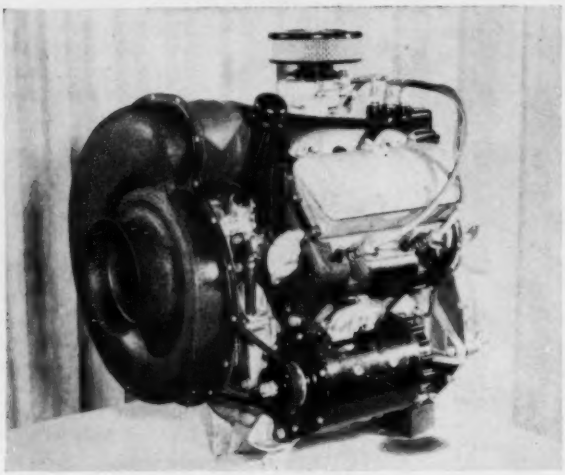
(Circle No. 39 on Reader Service Card)

Say You Saw It In
Automotive Service Digest

aluminum in newly designed engines is most optimistic.

Q: Is a wear-resistance type of aluminum alloy for cylinder blocks now existent, or foreseeable, that has comparable casting characteristics, machineability, rigidity and so on, and which would be serviced substantially the same as conventional grey iron blocks?

A: No, an aluminum alloy of this type is not presently available. However, many researchers, including Alcoa, are directing their efforts toward that



Example of an air-cooled, V-4 engine weighing but 200 lbs. It has 70 lbs. of finished aluminum and develops 62 hp. Cylinders, heads, covers and timing gear housings are designed for aluminum die-castings to reduce machining time, weight and costs.

goal. The aluminum-high silicon alloys being investigated fulfill some of these characteristics, but would still require special practices.

Q: With an aluminum cylinder head on an aluminum block, how might head bolt tightening affect the assembly? Would special precautions be necessary by the shopman?

A: Improper tightening will distort the aluminum part more than its iron counterpart. The present iron engine practice using manufacturers' recommended torque wrench settings and specified order of tightening should be followed, as well as retorquing hot after engine warm up.

Hardened and ground steel washers should be used under bolt heads and nuts. Spark plug threads as well as all threaded holes in the aluminum joined parts should be kept clean and nick free. Care should be taken in lowering the aluminum head over locating dowels, to avoid damage to dowel holes and insure proper seating of the head on the block.

Q: Will the mating surfaces of aluminum blocks and heads be sealed with the same kind of gaskets (steel embossed, copper-asbestos, etc.) used with cast iron blocks and heads?

A: Yes, the gasket practice would be the same in most cases. In our work we have used standard gaskets with success. However, the particular aluminum engine design will dictate the gasket practice; and engine manufacturers' recommendations should be closely followed. Avoid the use of water absorbent gasket materials.

Q: Since aluminum engines will use many parts (head bolts, valve seat inserts, valve stem guides, exhaust manifolds and so on) made from other metal than aluminum, and subject to wide variations in operating temperature, how will parts distortion due to unequal expansion and contraction be controlled to minimize possible service problems?

A: The excellent thermal conductivity of aluminum will minimize local hot spots, the temperature distribution throughout the part will be more uniform, and thermal distortion will be at a minimum. Design of the aluminum components in the engine will alleviate this problem, which assuredly is present.

Q: In the development to date of the aluminum engine, is there any one type—L-head, Vee, Opposed cylinder, etc.— that lends itself most readily to the use of the lighter metal?

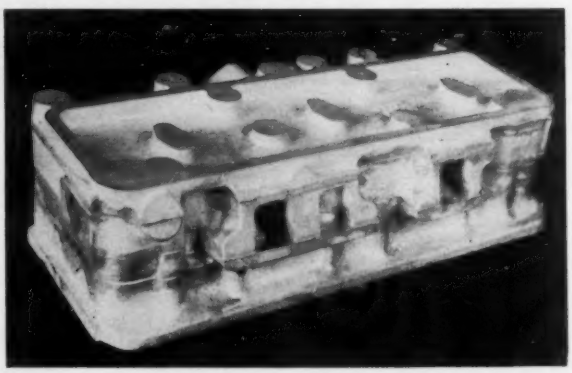
A: Aluminum is adaptable to all modern engine configurations.

Q: While, understandably, there are various problems which may have to be resolved before the aluminum engine comes into general use for automobiles, what, in your opinion, is the major problem at the moment?

A: In our opinion, the major problems at present are cylinder bore material, which in turn affects engine design, and main bearing practice.

Q: Does the possibility of an aluminum engine

Sand cast type of aluminum cylinder head. Tests show an increase in power occurs with an aluminum head, with a sizeable reduction in the octane number requirement of the fuel.



reflect as a major engineering improvement which will offer future motorists many valuable advantages, or will the advantages be mostly on the manufacturing end?

A: The reduced vehicle weight with the use of the aluminum engine will be reflected in easier steering, better control, reduced tire wear, and a reduction in braking effort. Whether or not the operator of the vehicle will benefit from any of these advantages, or a reduction in fuel consumption, is so dependent on type of operation that a general statement cannot be made.

Q: We know that during overhaul mechanics are called upon to remove ridges at the top of cylinder walls, remove pockets and wear spots in the cylinders, and rebore or hone to remove scores. Will any of these basic machining processes, applied to an aluminum block, tend to bite through the wear-proof coating of the cylinder itself?

A: Yes, if such a coating is used. However, if an aluminum alloy bore is adopted, practice will be the same as at present for iron.

Unnecessary Replacement of Shocks Reported by Studebaker-Packard

According to a recent Studebaker-Packard Service Bulletin, many shock absorbers are being replaced unnecessarily to overcome "rear shock absorber noise" on their 1957-'58 S-P models.

Before putting the blame on defective shocks, the factory recommends the following procedure first be tried:

1. Lift car by wheels or axles so that it remains in the roadload position (no passenger or trunk load).
2. Remove rear shock absorbers from rear spring clip plates.
3. Bend rear spring plate shock absorber mounting ear so that ear is positioned 90° to spring plate.
4. Replace original lower shock absorber mounting bolt with Part No. G181678 (bolt, 7/16-20x3"). Install ½" wide spacer (Part No. 524832) between the lower shock absorber mounting sleeve, and the rear spring plate.
5. Check the shock absorber alignment. When hanging free, the shock absorber should be positioned adjacent to the spacer. If not, bend the crossmember in the area of the upper mounting as required.
6. Reassemble, making certain that the shock absorber mounting bolt nuts are properly torqued.

Should the noise persist, then replace the shocks with new units.

Fleet Safety Training Program To Be Continued by Ford During '59

Ford Division of Ford Motor Company plans to continue for another year its Fleet Safety Training program, which received nation-wide attention during 1958 for assistance to hundreds of trucking companies in cutting accident costs by helping drivers upgrade their driving skills.

Based on a pioneer approach to safe driving, the program has been sponsored by Ford Division's Truck Marketing Department since mid-1959. Safety directors from more than 300 trucking companies—representing ownership of about 250,000 trucks nationally—have participated in five-day training courses conducted by Ford in 11 key cities.

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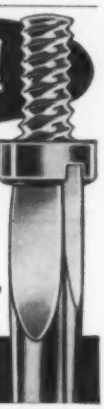
2" to 14" blades. 4 bit sizes. Available with shockproof plastic covered tubing. Unconditionally guaranteed.



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5. Dynaflow
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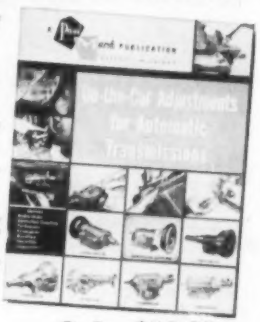

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IGNITION PARTS MERCHANDISING . . . New 16-page illustrated manual explains the Merchandiser program of Guaranteed Parts Co. Shows and describes the complete new line of cabinets. Gives specs and shipping weights, as well as marketing tips based on 50 years' experience. Copies free on request.
(Circle No. 40 on Reader Service Card)

SEALING TECHNIQUES . . . New brochure published by American Sealants Company describes use of its "Loctite Sealant" in maintaining tolerances and alignment of anti-friction bearings. Also covers applications with nuts and bolts, oil seals, bushings and high-pressure joints. Includes grade selector charts and usage tables for calculation of costs; case histories; listing of Military Standard parts numbers.
(Circle No. 41 on Reader Service Card)

STEAM CLEANING . . . Four-page catalog provides complete application data on John Bean Division's liquid detergents and dry compounds for steam cleaning. Five cleaners are covered . . . directions for proper mixing of formulas given, as well as tips on usages.
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REPLACEMENT AXLES . . . *Supplement No. 1* from U. S. Axle Co. brings the firm's most recent catalog up-to-date. Gives 20 pages of listings of replacement axle shafts, made by the company, for passenger car, truck and bus applications. Manufacturers' original numbers are listed as an aid to proper identification. In addition to 1957 and 1958 applications, revisions from previous lists of 1948-56 are also included in new sections. Information given is amplified by Numerical listings for Timken Rear Axle Assemblies, a Timken Interchange List and Eaton Master List. Copies free on request.
(Circle No. 43 on Reader Service Card)

AIR COMPRESSORS . . . Three different models are presented fully in a new four-color, 12-page bulletin from Westinghouse Air Brake. Provides comprehensive specs on pressures, displacements, dimensions, etc.; covers component parts and accessories; uses cutaway drawings in illustrating operating principles and construction; also devotes a section to specs and dimensions of air receiver and auxiliary storage tanks. Copies of *Bulletin SG-2* are free on request.
(Circle No. 44 on Readers Service Card)

INFRARED DRYING . . . Latest data on mobile infrared ovens offered by Fostoria Pressed Steel Corporation, is offered shops specializing in partial refinishing of cars and trucks. *Fostoria Portable Infrared Units* describes products designed for fast, uniform, low-cost drying of hoods, fenders, tops, rear decks and similar areas; includes details on new unit for use with epoxy resin materials. Models discussed range from two-lamp spot driers to "jumbo" panels for complete section refinishing.
(Circle No. 45 on Readers Service Card)

METAL SPRAY SALVAGE . . . *Mogul Metallizing Folder* describes compact equipment for use in repairing and rebuilding automotive parts using pressurized metal spray. Shows and explains the "gun" used, and illustrates three steps in building a permanently leak proof body section in a cracked engine block. Also shown and described is work on axle flange shafts and crankshaft journals. Copies free on request.
(Circle No. 46 on Readers Service Card)

1959 AUTO LAMPS . . . Available from any supplier of G-E miniature lamps is the new 1959 Auto Lamp Chart. Lists all lamps used in all domestic cars, and in the popular trucks. Incorporates two new features: identification of all makes and models on which the new G-E Suburban Headlamps can be used; indexes those that can be used on import cars.
(Circle No. 47 on Reader Service Card)

BRAKE SHOE KNOW-HOW . . . Instruction sheets with step-by-step directions on the installation of brake shoes are now packed with all Wagner Lockheed line brake shoe sets. Designed to permit all mechanics to use the most expert procedure in reline jobs, the instructions are amply illustrated and detailed; and are "individualized" by specific set.
(Circle No. 48 on Reader Service Card)

FUEL PUMPS . . . Colorful 17 x 22" wall chart shows original and replacement fuel pump application numbers. Lists all car and truck models 1937-58 in open-face numerals, for quick, easy-reading reference. Also lists minimum and maximum pressures for testing fuel pumps on engines. Copies are free on request.
(Circle No. 49 on Reader Service Card)

BRAKE SERVICE . . . A new manual, planned as the most authoritative available is introduced at the IASI Show by Grizzly Brake Shoe Division of MarPro, Inc. Covers application details for all types of linings, and is profusely illustrated. Contents are divided into four sections: fundamentals of operation; description of brakes by trade names and makes of cars; trouble-shooting; servicing. The firm is also releasing 10 new supplementary pages for its previously published Brake Shoe Identification Manual.
(Circle No. 50 on Reader Service Card)

HYDRAULIC JACK REPAIR . . . New illustrated brochure by Jack-Pack Manufacturing covers restoration of hydraulic jacks to trouble-free operation. Explains the basic moving parts of these units, and their replacement with repair-kit elements. Copies free on request.
(Circle No. 51 on Reader Service Card)

REPLACEMENT PARTS . . . New 12-page catalog supplement illustrates and describes up-to-date automotive replacements. Among the new items covered are a Universal Manual Choke Conversion Kit, and Universal Idler Arm Take-Up Kit; new Chevrolet car and truck parts. Other replacements of wide-spread applica-

You may want this information, and most of it comes to you free. Just circle the key number on the Reader Service Card corresponding to the one that appears with the editorial review. Our Reader Service Department will forward your inquiry to the manufacturer or supplier for attention.

tion include lock nuts, retainer rings, door check links and supports, spring insert silencers, oversize drain plugs. Application information is presented in table form. Copies free on request.
(Circle No. 52 on Reader Service Card)

METRIC VS. STANDARD THREADS . . . Two-part bulletin includes a special metric conversion chart designed to enable service shops to replace worn, stripped or damaged metric threads with standard American sizes. Intended to alleviate the problem of thread repair where metric or Whitworth taps, screws and bolts are not available, the literature provides conversion sizes in both National Fine and National Coarse series. Other sections provide details on the use of Heli-Coil inserts for repair, as well as specs on taps, inserting and extracting tools.
(Circle No. 53 on Reader Service Card)

WELD ELECTRODES . . . Manual arc types for hard surfacing and for welding stainless steel, cast iron and nonferrous metals, are covered in the new 20-page *Bulletin 7000.2* published by The Lincoln Electric Company. Describes each electrode, its properties, methods of application; and identifies machines in which used. Copies are available on request.
(Circle No. 54 on Reader Service Card)

HEAVY DUTY HOISTS . . . Hydraulic types used in servicing trucks are the subject of a well illustrated, three-color bulletin just published by Globe Hoist Co. Covers four models of a two post "saddle and long rail" hoist offering lift capacities from ten to twenty tons. Gives complete specifications; details design features; describes applications. Form No. A 611 is available on request.
(Circle No. 55 on Readers Service Card)

RUBBER-METAL PRODUCTS . . . Bearings, bushings, couplings, mounts, sleeves and molded shapes, are among the products covered in a new 12-page, illustrated catalog. Offered by Clevite Harris Products, Inc., the literature also presents design information—such as formulas for determining permissible radial, torsional, axial and conical loading. The firm's custom compounding, molding and bonding services are explained and described.
(Circle No. 56 on Reader Service Card)

PLASTIC BODY PASTE . . . Four-page circular describes FILLERite, an entirely new type of plastic paste which uses a powder-type catalyst to speed up or slow down curing time . . . tells the many ways it can be used in making autobody repairs as well as for many other types of repairs, customizing and reinforcing jobs.
(Circle No. 57 on Reader Service Card)

WELDING WIRE . . . Bulletin DH-1218-0, just released by Page Steel and Wire Division of American Chain & Cable Co., replaces all previously issued publications on welding wire comparisons by the Company. The new Bulletin in a four-page folder which details the physical properties as welded; gives analyses, tensile strength, elongation and average Rockwell hardness. It also lists typical uses of gas welding rods, bare electrodes, automatic welding wire and metal spray wire. Page Division products are compared with competitive makes.
(Circle No. 58 on Reader Service Card)

Calendar of Automotive Events

1959

Feb. 2-5—Automotive Accessories Manufacturers of America Show, Coliseum, New York, N. Y.

Feb. 15-17—Motor and Equipment Wholesalers Assn., National Convention, Conrad Hilton Hotel, Chicago, Ill.

Feb. 15-17—Automotive Affiliated Representatives Meetings, Pick-Congress Hotel, Chicago, Ill.

Feb. 18-21—Automotive Service Industries Show, Navy Pier, Chicago, Ill.

Feb. 27-March 8—World Wide Auto Show, Miami Beach Exhibition Hall, Miami Beach, Fla.

March 11—MEWA Western States (PAS) Conference, Fairmont Hotel, San Francisco, Calif.

March 12-15—Pacific Automotive Show, New Brooks Hall, San Francisco Civic Auditorium, San Francisco, Calif.

May 3-8—Top Management Institute, Motor and Equipment Wholesalers Assn., Allerton House, University of Illinois, Monticello, Ill.

May 17-20—Automotive Engine Rebuilders 37th Annual Convention, Royal York Hotel, Toronto, Ontario, Can.

Nov. 2-5—Automotive Warehouse Distributors Assn., Annual Convention and Manufacturers'-Distributors' Conference, Muehlebach Hotel, Kansas City, Mo.

June 24-27—Independent Garage Owners of America, Inc. (IGOA) National Convention, Albany Hotel, Denver, Colo.

Oct. 28-30—Automotive Parts Rebuilders Assn., 12th Annual Convention, Hotel Roosevelt, New Orleans, La.

MANY MAKE OVER $10,000 A YEAR! "After 3 months we are doing $850 per mo. in radiator work and increasing all the time"—Robbins Motor Co., Marlow, Okla. "Now going at rate of $18,000 a year," says Clough, Storm Lake, Ia. You, too, can do this well!

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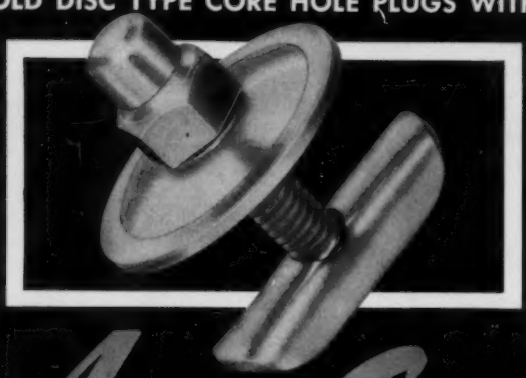

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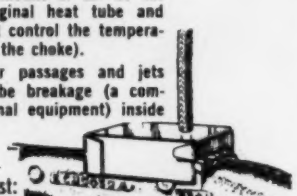

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1914 W.Washington Blvd.
Los Angeles 18, Calif.

Craftsmanship . . . (*Continued from page 39*)

removed and will be re-installed are kept on clean cloths or in clean containers. Oil that may drip from parts or drain out of transmissions, pumps, etc., will be wiped up, not allowed to stand in puddles.

Craftsmen understand the damage that foreign matter, dirt and grit can do to accurately fitted surfaces, and exercise extreme care to prevent injurious material from getting into working parts.

"Sharp" owners and managers of shops, large and small, are craftsmen enough to set standards of cleanliness and order, and see that they are lived up to. Increased efficiency, fewer errors, improved morale, and better work, make good shop housekeeping a paying investment. Clean floors and walls, ample light, and orderly arrangement of the shop fixtures, as well as the work, make a better work environment, and attract the best mechanics.

CHECKING OUT THE WORK

The craftsman appreciates the necessity of going over the job to see that there are no loose ends. With the number of detailed operations involved in many service jobs, it is easy to leave a screw out, a wire disconnected, an adjustment unmade. Careful inspection and running test will reveal whether everything is complete and in order.

There was the case of a good tune-up man who made a single, but expensive mistake by failing to check carefully. To test generator output, he had put a grounding jumper from the generator field to ground on a Dodge engine. Hurrying to get the job out in the time promised, he neglected to remove the jumper wire. The engine ran nicely, and the customer took out the car. Next day he was back with a burned-out generator. Needless to say, the shop had to replace the generator, and to be on the safe side, install new distributor breaker points.

WORKER "WORTHY OF HIS HIRE"

In times past, when costs were lower and the pressure to get the work out was less, mechanics took a great deal of pride in doing fine work. Today's craftsmen enjoy that same sense of personal satisfaction. Unfortunately, though, there is a rather common tendency in some quarters, to do work just well enough to "get by."

"Get the car and customer out of the shop, and the bill paid," seems to be the attitude in some shops. Following-up in the same vein, "If there's a complaint, we'll do only what's absolutely necessary to keep him from raising too much of a fuss."

This attitude itself, oddly enough, makes automotive craftsmanship all the more important and valuable to a good shop. It has driven motorists to search for shops where service work is done "right the first time."

Surveys show that customers object far more strongly to poor work than to higher price. When asked the reason for dissatisfaction with a shop, the majority of car owners invariably points out incomplete or improper diagnosis, careless servicing, or jobs that must be taken back for rework. On the other hand, asked to give reasons for preferring a particular shop, customers most often reply "good service."

To the shop, craftsmanship is the best guarantee of repeat business, of winning and keeping customers. To the craftsman himself, it's the best guarantee of advancement, higher earnings, satisfaction in his own work, in other words, getting the best out of his native abilities and interests.

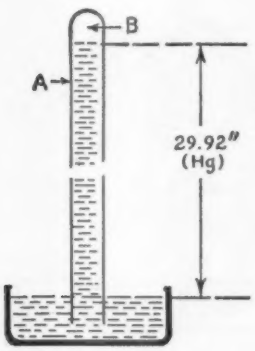
BRUSHING UP ON THOSE EASY-TO-FORGET THINGS

Refresher course

Vacuum Gauge Readings

• IF A 3/16″ GLASS TUBE (A), about 33″ long and sealed at one end, is filled with mercury (Hg) and immersed in a bowl of mercury, the mercury in the tube drops to a level corresponding to the atmospheric pressure on the mercury in the bowl.

Stated another way, the air pressure on the bowl of mercury forces the latter upwards in the tube to a height of 29.92″, or the equivalent of 14.7 lbs. p.s.i., the standard atmospheric pressure at sea level.



Altitude (Ft.)	Atmospheric Pressure	Vacuum Reading
Sea Level	14.7	19.5
1000	14.1	18.5
2000	13.6	17.5
3000	13.1	12.5
4000	12.5	15.5
5000	12.3	14.5
6000	11.6	13.5

A perfect vacuum will exist in space B, since no air is present. Vacuum is measured in inches of mercury. Conventional engine manifold vacuum is always less than atmospheric pressure. As the engine operates this vacuum will vary from a few inches of mercury to a maximum of about 21″.

Vacuum gauges used in tune-up work measure the amount less than atmospheric pressure. When the gauge reads zero, it actually is indicating atmospheric pressure. This pressure is lower at higher altitudes and, therefore, vacuum gauge readings also are lower. An engine in good condition at normal operating temperature indicates a vacuum reading between 18″ and 21″ of mercury at idling speed. Approximate readings for different altitudes are given in the table.

Tool Tips *for the Mechanic*

Dynaflow Transmission Service

You can pull the front pump seal on Dynaflow transmissions without disassembly if you use *Snap-on*® CJ-66-42A Oil Seal Puller. Tool threads into oil seal and pulling is done with the 66-1 Slide Shaft and 66-2 Booster Hammer. Tools are described in *Snap-on* Catalog W — page 99. Ask your *Snap-on* dealer.

Torquing Pontiac Head Bolts

Cylinder head bolts on 1958 Pontiac V-8 engines can be torqued easily with a *Snap-on* S-8683 ¾-inch Boxocket® and a TQ-150 Torqometer. The S-8683 also handles cylinder head bolts on small 1958 Ford, Mercury and Edsel engines. Pages 35, 69, *Snap-on* Catalog W.

NEW TOOL

Snap-on MT-20
Throttle Idle Control Clamp

An extremely useful tool for controlling engine idle speed while making tests with the *Snap-on* Anal-O-Scope or other electrical test equipment.

Attach bracket of tool to throttle rod and tighten into position with knurled screw. Place other end of tool on any available brace, then turn adjusting nut until motor idles at desired speed. Tool is easily removed. Motor returns automatically to original idle — no need to adjust idle stop screw. Tool is brand new — not shown in *Snap-on* Catalog W. Check your *Snap-on* dealer or write us.

Cadillac Caster-Camber

1957 models are adjusted easily by cutting front wheels sharply and using *Snap-on* NS-24 Nut Spinner Handle, SX-36 Extension Bar and SU-26 Flexocket. *Snap-on* Catalog W — pages 19 and 21.

Edsel-Mercury Distributor Work

The *Snap-on* S-9476A ½-inch Double Hex Boxocket quickly removes or loosens Edsel and Mercury distributors that are mounted at the front of the engine. This wrench is a special, originally designed for Chrysler, DeSoto, Dodge and Plymouth distributors. Page 70 of *Snap-on* Catalog W.

Get your copy of the new *Snap-on* Catalog W. Ask your *Snap-on* man or write direct. Watch for further Tool Tips in future issues of this publication.

SNAP-ON TOOLS CORPORATION
8035-BT 28th Avenue • Kenosha, Wisconsin
(Circle No. 131 on Reader Service Card)

Interchangeable parts are no problem

• NO PROBLEM, that is, if you know where to get reliable information quickly, and can check sizes and parts with speed and accuracy.

"Interchangeability" is used with several differing meanings when it comes to the automotive engine, transmission, drive line, rear axle, chassis and body parts. So perhaps we should start by defining its meaning here. Strictly speaking, "interchangeable" parts are those that fit accurately and without alteration in corresponding places on one or more model cars, which are not necessarily of the same make.

In addition, the practical shop definition would cover certain parts that can be used to handle a given mechanical function if a change is made in mating or joining parts. For example, it may be possible to use an available clutch shaft—in place of one not readily obtainable—by exchanging the clutch plate for one with matching diameter and number of splines. Certain other parts can be used interchangeably if they are adapted to the car by relatively minor work—such as providing different engine mounts, drilling different bolt holes, etc.

In general, of course, such work is uneconomical; and would not be done except at the customer's request. However, all service shops face the situation, from time to time, when a necessary part just can't be obtained quickly or easily enough. Substitution is often decided upon to meet the need of the moment.

Quite often, a part on hand or readily obtainable will fit, and actually be as satisfactory as the original part. However, this part may be listed under a different number—even a different name—and for a car of another make.

Many shop men do not realize that there are thousands of parts which are used in from two to ten different cars each, but are specified under different numbers for each car.

With specific information on this duplication, an automotive service shop is in a position to carry a smaller inventory of parts—and further, to "put its hands on" a needed part, or one that will serve satisfactorily, much more readily.

One source of such information is the Hollander Manual, now available in the 24th Edition from Hollander Manual Company, 7007 Walker St., Minneapolis 26, Minnesota. Described by its publisher as the "Bible of Interchange," the Manual goes into great detail on 10 general classes of automobile parts: bearings; body parts; cooling and fuel; electrical; steering and suspension; engine; axle and drive shaft; springs and shocks; wheel hubs and brakes; clutch and transmission.

There is also a General Information section, which gives abbreviations, model identification, automobile serial numbers back to 1942, engine numbers, an automatic transmission identification table, and other basic data.

Where the shop is faced with a hard-to-get part situation, a reference of this type will cut time and costs. It is especially helpful in the case of older cars, for which the original parts are no longer produced, although certain ones made for later models may safely be substituted.

WHEN CHANGING YOUR ADDRESS

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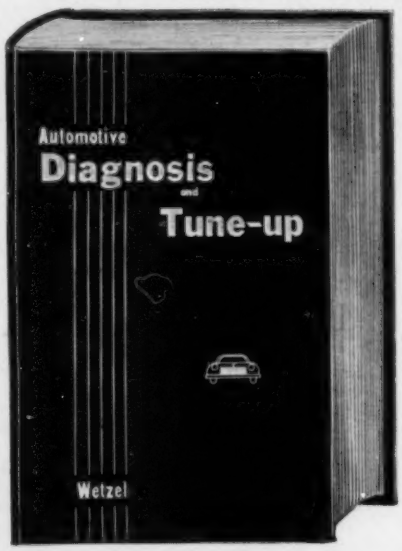

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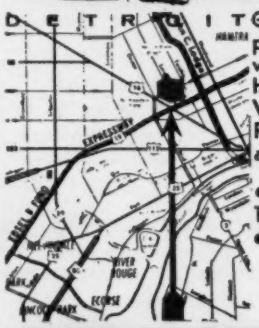

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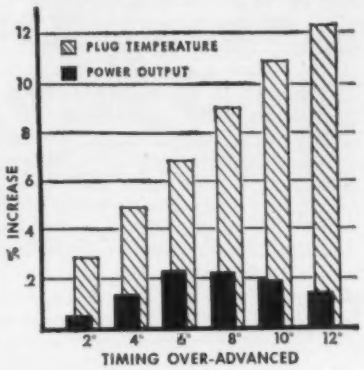
The Truth About Power Timing

Most mechanics now know "power timing" (over-advancing ignition timing to produce a slight gain in maximum power output) can be harmful to an engine, as pointed out by most engine manufacturers. Yet the potential danger is not always fully appreciated.



To dramatize this point, Champion Spark Plug Co. uses a factory-developed thermocouple (a conventional spark plug with a tiny "thermometer" built into the tip of the insulator) in its "Service Tips" engine demonstration which gives immediate indication of spark plug firing tip temperatures, as well as temperature affects on other engine components.

As can be seen from the accompanying graph, advancing the timing beyond the manufacturer's recommended setting will sometimes produce a slight power increase, but properly adjusted timing can greatly extend the life of the spark plugs, valves and other engine parts. It should also be noted that *power falls off and plug temperatures soar* after a few degrees of over-advance.

Suspension Systems . . . (*Continued from page 27*)

The rubber bushings used in the control arm shafts and the sway bars seldom require replacement until the vehicle has clocked up considerable mileage. When the bushings do wear out, the control arms and/or the sway bar are removed from the vehicle and are pressed in and out while the units are held securely in a bench vise.

MAINTENANCE

Torsion bar suspension is a clean, well-designed, long-lived system. It's not unusual for cars with torsion bar suspension to roll along for years requiring nothing more than an occasional wheel alignment check and normal periodic lubrication. Because shims are used to control caster and camber, something drastic must usually happen before even the front end alignment needs correction.

Bushing wear can be accelerated if the bushings are lubricated with any form of grease or oil. The bushings are designed to operate *dry*, and no lubrication of any kind is recommended for them. As an aid to bushing replacement, they may be dipped in clear water just before installation, but, again, not in oil or grease.

Torsion bar suspension lubrication should be limited to eight lube points (one on each ball joint, and one on each tie rod end). Turning the steering gear back and forth while applying grease to the upper ball joints will help the lubricant penetrate the joint and cover the entire contact surface with a grease film. The lower joints are usually unloaded as the vehicle is raised so that it's possible for the lubricant to penetrate easily without working the steering gear.

Good design and construction make torsion bar suspension systems easy to maintain and comparatively easy to service.

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Con Rod Bearings . . . *(Continued from page 22)*

blade, as shown in Fig. 13. End play of two rods on V-8 engines, unless otherwise specified by the factory, is ideal at .006 in. and serviceable at .008 in. If the end play is as great as .010 in. it is excessive. This may indicate old, worn rods that should, of course, be replaced. If servicing an engine with a single rod on each throw, deduct .002 in. for the values just given.

When the bearings are installed there are two ways that are proving popular for checking clearance. With the oil wiped carefully from the bearing and crankpin, lay a thread of "Plastigage" on the crankpin, as shown in Fig. 14, and tighten the cap down on it to specified torque. Actually, this illustration was made on an engine that was out of the chassis. Working under the car on a bearing job, lay the Plastigage on the bearing surface in the cap, and bring the cap up into position on the shaft. Have the shaft turned so that the plastic does not get into the oil hole. At the last minute take another look to be sure that oil has not come down from the hole or it will smear up the plastic. Tighten the cap and then lower it. Don't turn the shaft. Like stepping on a piece of chewing gum that spreads wider the harder you step on it, the cap squeezes the plastic according to the clearance between the bearing and the crankpin. The plastic material is of precisely controlled diameter. Consequently it spreads with accuracy and indicates on a printed scale, shown in Fig. 15, the clearance of the bearing on its crankpin.

In the absence of specific factory information, oil clearance on rod bearings for most engines will prove satisfactory if it ranges between .001 in. and .002 in.

SUDDEN BINDING SPELLS TROUBLE

It is wise to be alert for sudden binding, as the bearing caps are tightened. It is true that as each bearing is torqued, additional drag results. But if the torquing of any one bearing makes it suddenly impossible to continue to turn the shaft by hand, there is something wrong. Watch for the alignment of the locking lip of the bearing in its groove in the cap or rod. Recheck the bearing for the slightest speck of dirt between the bearing back and the rod or cap. And be very careful to avoid prying sideways on the rod nut with the socket wrench in a way that would force the bearing cap out of true. Great leverage can be created between the wall of the socket and the bearing cap; so never pull sideways on the wrench. Use both hands on the torque wrench to balance the energy that you put into tightening the nut, so that the entire force exerted is a rotating and not a prying force.

Finally, before buttoning up the job, a recheck with the bearing oil leak detector, Fig. 2, is excellent "comeback" insurance. Uniform dripping of oil from all bearings indicates uniform clearance. To be sure that the test is "telling the truth," crank the engine over by hand while the oil pressure is on. Otherwise you could conceivably have a loose bearing, but one in which the oil passages were not lined up.

If you get uniform dripping—not pouring—from each bearing throughout one revolution of the engine, you've got yourself a rod job that should build prestige and business. It need hardly be stressed that such a job deserves a new oil filter in order to give it every possible advantage. As has been said, "The quality and cleanliness of the oil has a direct bearing on the wearing since it controls the wearing on the bearing."

We sincerely appreciate the cooperation of the following organizations in providing the illustrations listed: Ford Motor Company, Fig. 3; Federal-Mogul, Figs. 2-4-5-6-9-10-11-12; Chevrolet Division, General Motors Corporation, Figs. 7-8-13-14-15.

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HE WHO LAUGHS, COME WHAT MAY,

WILL LIVE TO LAUGH ANOTHER DAY

Short circuit smiles

She was a new bride whose knowledge of the culinary art could be contained within any full-stop in a cook book, and her husband had a live turkey sent home to prepare for the guests who were coming for Christmas dinner.

When he arrived home, he inquired how she had managed with the big bird and she told him it was in the oven. Going into the kitchen, the husband heard a knocking on the oven door. When he opened it, a head popped up out of the broiler and said, "For the love of Pete, either light the oven or give me back my feathers. It's getting darned cold in here!"

★ ★ ★

Irate Father: "Why were you kissing my daughter in that dark corner last night?"

Dubious Youth: "Now that I've seen her in daylight I sort of wonder myself."

★ ★ ★

A gentleman sitting at a bar one evening happened to glance at the entrance just as a young man entered wearing black Bermuda shorts, a black cashmere sweater, a tam and a string of pearls . . . with great surprise, this gentleman said to the bartender, "Did you ever see anything as crazy as that?" The bartender answered, "What else would you wear with basic black?"

★ ★ ★

Maizie: "I got a gold medal and $100 cash to go with it."

Daizy: "What did you enter to win it?"

Maizie: "The beauty contest judge's apartment."

★ ★ ★

Doctor: "I've examined you thoroughly, and I can't seem to find the cause of your illness. It might be due to drinking, however."

Patient: "Oh, that's all right, Doc. I'll come back sometime when you're sober."

There's a new deodorant out called Vanish. After you rub it on, you disappear and nobody knows where the smell comes from.

★ ★ ★

A comely young matron stepped on the drugstore scales after devouring a giant sundae and was shocked at what she beheld. Promptly she slipped off her coat and tried it again. The results were still unflattering, so she slid off her shoes. But then she discovered she was out of pennies. Without a moment's hesitation, the lad behind the soda fountain stepped forward.

"Don't stop now," he volunteered. "I've got a handful of pennies and they're all yours."

"This is what you meant when you said you were going to look at some rings?"

Immediately after landing his space ship on the planet earth, a Martian waddled into the nearest bar, with every tube in his head spasmodically glowing on and off in a wide array of blues, reds and greens... While sipping his third martini, enjoying the earthian atmosphere, he noticed a man inserting a coin in the juke box causing the lights of the music machine to spasmodically glow on and off in the same array of colors as his own... whereupon, he ambled over to the juke box, stared for a moment, then queried "Now tell me, what is a nice girl like you doing in a joint like this?"

★ ★ ★

A drunk approached a large hotel in the windy city, Chicago, just as a gust of wind spun the revolving doors. The drunk steps back, looks up at the tall building, turns to the doorman and says, "He'll never get it off the ground."

★ ★ ★

A television salesman had taken in a lot of used sets as trade-ins on new models and was desperately trying to peddle some of them. "This set is in excellent condition," he reported to a prospective customer who had questioned him about one of them. "Why, it was owned by a little old lady with weak eyes."

★ ★ ★

Personnel Director, interviewing young curvy thing: "And on this job you must be determined to show your ability or bust . . .!"

★ ★ ★

The young man was met at the door by his sweetheart.

"Well," he said, "what shall we do this evening?"

"Darling," she exclaimed, "Father is giving a sermon tonight on 'Love One Another.' Shall we attend?"

"I should say not," her beau returned. "Let's stay home and practice what he preaches."

★ ★ ★

A car screeched to a halt at an intersection, barely missing a white-haired old lady. But instead of giving the driver a tongue-lashing, she recovered herself quickly, smiled sweetly and pointed to a pair of baby shoes dangling from his rear-view mirror.

"Young man," she asked, "why don't you put your shoes back on?"

★ ★ ★

The candlestick maker still has the best job. He only works on wick ends.

★ ★ ★

Looking coldly at the man who had just given him a nickel for carrying his bags twelve blocks, the little boy said, "I know something about you."

"What?" asked the man.

"You're a bachelor."

"That's right. Know anything else about me?"

"Yeah. So was your father."

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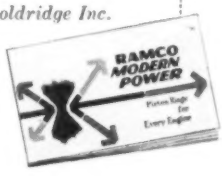

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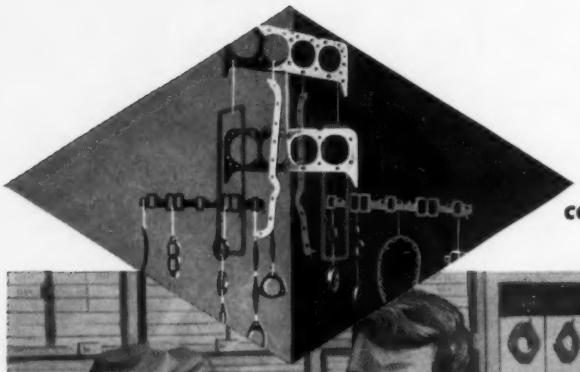

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